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THE GUM-TREE SCALE AND ITS CONTROL.

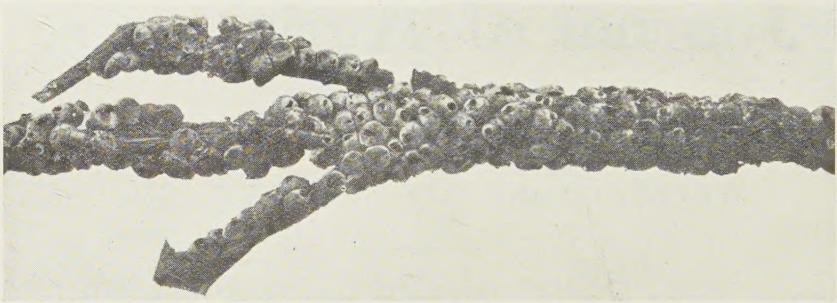
DAVID MILLER, Entomologist, Biological Laboratory.

ONE of the most destructive insects to eucalypts is the gum-tree scale or "blight" (*Eriococcus coriaceus* Mask.). It does not confine its attention to any one species but attacks practically all, although some, such as the blue-gum (*Eucalyptus globulus*), suffer more extensively than others.

An examination of a branch or twig from a badly infested tree (Fig. 1) reveals a number of more or less closely packed grain-like bodies attached to the bark. Each of these is reddish-brown, tawny, or sometimes white, and consists of a globular sac of felted material with a circular opening at the posterior end, the whole measuring about $\frac{3}{25}$ in. in length (Fig. 2). Within this sac the female insect lies; the latter is somewhat flattened, oval in outline, blood-red in colour, and possesses six well-developed legs, but no wings. From the under-side of the head a delicate hair-like proboscis projects, being thrust through an opening on the under-side of the enclosing sac towards the anterior end, and thence into the bark of the tree. The insect feeds upon the plant-juices in this way, and in heavily infested cases the drain is so severe that the tree rapidly wilts and eventually may be killed.

Not only is the tree injured through loss of sap, but its death is hastened by the large quantities of the sticky "honeydew" exuded by the insect. This exudation collects on the foliage and bark, and suffocates the tree, while at the same time a black mould grows upon the honeydew, giving the characteristic fire-scorched appearance to infested trees. The enclosed insect is stationary within the sac, which is a permanent fixture, being attached by the under-side to the bark. However, if the sac is damaged in any way the insect frequently withdraws its proboscis and leaves its dwelling.

When the loose bark is stripped from the trunk of an infested tree more or less large white patches are found attached to the young bark (Fig. 3). These patches are composed of innumerable small, white, cottony sacs, each the habitation of a male insect. Unlike the sac of the female, that of the male is loosely woven, oval in outline, and



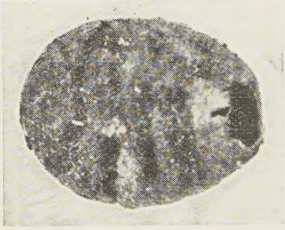


FIG. 1. EUCALYPT TWIG INFESTED BY FEMALE SCALES, SLIGHTLY ENLARGED.

[*Photo by E. B. Levy.*

FIG. 2. SAC OF FEMALE SCALE, SHOWING APERTURE AT POSTERIOR END. × 10.

[*Photo by H. Drake.*

more or less flat. The male when comparatively young loses its proboscis, but develops a pair of wings and a pair of long white thread-like appendages from the end of the abdomen. The male further differs from the female in passing through a resting or pupal stage in its development. The adult male is a very small, dark-red, two-winged, fragile insect, taking no nourishment.

The female lays no eggs. In the autumn and spring immense numbers of young insects are born alive, and crawl out of the parent sac through the opening at the end (Fig. 2). It is now definitely known that there are two broods of these larvæ, one in the autumn and the other in the spring, but there is no doubt that observations which are being carried out will reveal other broods during the summer

months. During the birth of a brood the young are so small and numerous that they form a fine reddish dust upon the trees, and it is during this stage that the insect is carried long distances by the wind, and, landing on healthy trees in a new locality, spreads the infestation. On settling upon the leaves the larvæ usually take up a position along each side of the midrib, and commence to suck the plant-juices and exude the honeydew. At the same time the beginnings of the protecting sac are secreted in the form of white waxy threads, so that a white strip soon becomes conspicuous along each side of the midrib (Fig. 4). The males take up their position

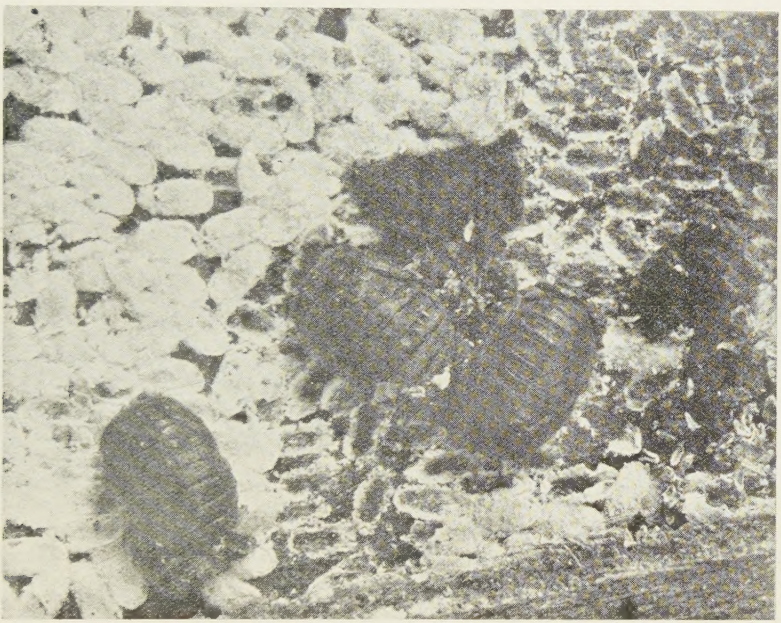


FIG. 3. PATCH OF MALE SCALES AND FOUR PUPÆ OF THE LADYBIRD.
The scales at upper right-hand corner have been eaten out by the ladybirds. × 6.
[*Photo by D. Miller.*

beneath the dead bark, but most of the females soon leave the foliage and concentrate along the twigs and younger branches.

The relation of prevailing winds and mountain-ranges to the spread of the scale has been studied, and it is apparent that the spread of the blight is governed almost entirely by these factors. It originally (1900) appeared at Timaru, and was said to have reached that port from Australia on the bark of imported hardwoods. It spread rapidly north and south, and is now well established along the east of the Southern Alps, from Cook Strait in the north to Warepa, south of Balclutha. In the North Island it first appeared in 1921, in the Marton-Feilding district, and almost simultaneously at Wanganui.

From these west-coast districts it was wind-carried eastward of the main range, chiefly through the Manawatu Gorge, and has thence spread southward to Pahiatua and northward to Waipukurau. On the west side of the range it is at present as far south as Palmerston North.

Although wind is the main agent in dispersal of the blight, birds and winged insects frequenting infested trees are also responsible to a certain extent for its spread.

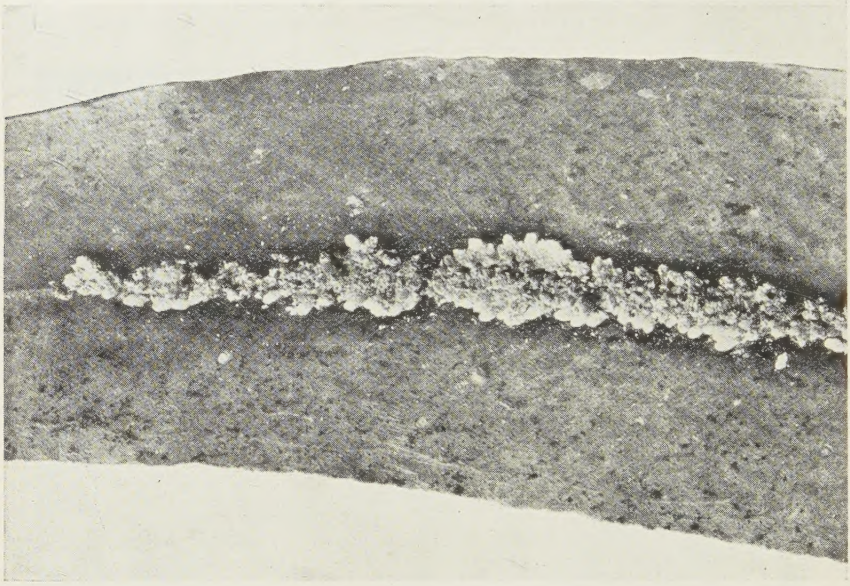


FIG. 4. PART OF EUCALYPT LEAF WITH YOUNG SCALES CONGREGATED ALONG THE MIDRIB. × 2.

[*Photo by H. Drake.*

CONTROL.

When the scale became established in the South Island its natural enemy, the ladybird *Rhizobius ventralis*, was imported from Australia by Mr. T. W. Kirk (then Biologist to the Department of Agriculture), and rapidly became numerous enough to control the blight. This beetle was therefore available in 1921 when the scale appeared in the North Island, and large consignments were collected in Canterbury and liberated in the infested areas of the North, where it is now well established. During the past spring more beetles were liberated, particularly round the outskirts of the infested areas of the North Island. Both the beetle and its larvæ attack the scale. The beetle (Fig. 5), which measures from $\frac{1}{6}$ in. to $\frac{1}{5}$ in. long, is much the same size and shape as the common black-spotted yellow ladybird. *Rhizobius ventralis*, however, is black in colour, except for the orange-yellow under-surface of the abdomen. There are no spots on the back, but

the insect appears as if covered with a greyish dust, which, under a slight magnification, is seen to be due to a sparse covering of short, rather coarse, somewhat silvery hair. When the beetle first emerges from the pupa it is of an orange-yellow colour, but this soon changes to black, except on the under-side of the abdomen. It is capable of flight and travels considerable distances. The larvæ (Fig. 6) are reddish-black and torpedo-shaped. The pupæ (Fig. 3) occur under the dead bark of eucalypts and are attached to the trunk; each is globular and dark reddish-brown.

Besides the ladybird the gum-tree scale is attacked by birds, the most active of which are the blackbird, thrush, and fantail. Mr. J. G. Myers (Biological Laboratory) has also observed the white-eye at

5 6

FIG. 5. ADULT RHIZOBIUS VENTRALIS LADYBIRD. × 5.

FIG 6. LARVA OF LADYBIRD. × 6.

[*Photos by D. Miller.*

work; while Mr. E. Whitcombe, of Eketahuna, writes that he has observed the tui clearing up the scale. The native bluebottle (*Calliphora quadrimaculata*) frequents the bark soaked with honeydew, upon which it feeds, even feeding on the small drops of the sweet secretion as it collects at the opening of the scale sac. Mr. R. G. Robinson, Superintendent to the Selwyn Plantation Board, states that he has observed the blow-flies suck out the juicy insect within the sac by inserting their proboscis through the opening.

Although the gum-tree scale is well under control in the South Island, and there is every hope of a similar success in the North, an endeavour is being made to secure from Australia certain chalcid parasites and a moth the larva of which is predaceous, in order to make the position more secure.

NOTE.—This article is a summary of a detailed and technical work which is being published elsewhere.

Dairy Industry Exhibition at Buenos Aires.—The Argentine Department of Agriculture is organizing an international dairy exhibition to open at Buenos Aires on 5th May, 1924. The scope of the exhibition will include dairy machinery and apparatus, refrigerating machinery, foodstuffs, literature and plans, &c. Space will be free of charge, but exhibitors will bear the expense of installation and display of individual exhibits. All exhibits from abroad will be free of Customs or other duties.

NOTES ON STOCK-BREEDING.

THE QUESTION OF INBREEDING.

Paper communicated to the New Zealand Board of Agriculture by Mr. EDWIN HALL, Onehunga, Auckland.

FEW questions affecting agriculture have excited more controversy than that of the inbreeding and cross-breeding of farm-animals. Charles Darwin spent over five years studying the problem, and finally summed up the position by saying: "That any evil directly follows from the closest interbreeding has been denied by many people, but rarely by practical breeders; and never, as far as I know, by one who has largely bred animals which propagate their kind quickly. When we consider the facts given, which plainly show that good follows from crossing, and, less plainly, that evil follows close interbreeding, the existence of a great law of nature is almost proved—viz., that the crossing of animals and plants which are not closely related is beneficial or even necessary, and that interbreeding prolonged during many generations is injurious."

This conclusion of Darwin's was arrived at more than fifty years ago, but subsequent investigations and scientific discoveries have thrown much light upon the subject that was not available in his day. Have they in any way modified the views he advanced in 1868?

It is well known that the early breeders—Bakewell, Colling, Booth, Bates, Cruickshank, Hugh Watson, and others—all bred-in most closely; partly because they held it was the quickest way of fixing the desired type (and that without a certain concentration of blood no family or herd could permanently improve our live-stock), and partly because their own stock possessed the particular qualities they desired to reproduce, and were better and more potent than any they could buy.

The famous bull Favourite, bred by Colling Bros., was the offspring of a half-brother and half-sister, and was himself mated with his own daughter, granddaughter, and great-granddaughter. He was the sire of Comet, to whom (it has been stated) most of the best Shorthorns trace back.

Bates's "Duchess" family was bred-in most closely for thirteen years; but during the following twenty years he three times introduced fresh blood into the herd on account of lessened fertility and impaired constitution. It is stated that in one season he lost twenty-eight calves from want of constitution; and that out of fifty-eight "Duchess" females which he raised between 1808 and 1844 twenty-four never produced calves. Mr. F. R. Marshall, however, has pointed out that it has not been clearly proved that it was the inbreeding which caused the barrenness in the Bates's "Duchesses," as the third "Duchess" had two barren daughters, by different sires, so that evidently the tendency to barrenness was present in the early members of the family. Bates himself said that to breed in-and-in from a bad

stock was ruin and devastation; yet the practice might be safely followed within certain limits, when the parents so related are both descendant from first-rate animals.

It has been asserted that the bulls raised by Amos and Anthony Cruickshank did more to improve the Shorthorns of Great Britain than any other strain, and that when the reaction set in against the use of Bates's bulls it was their cattle that saved the Shorthorn situation. For over twenty years they had bought high-priced winners for service on the Sittyton herd; but from about 1873 the herd was self-sustaining until its final dispersal. Mr. Amos Cruickshank wrote stating, "I never saw any tendency in either cows or bulls to deteriorate as breeding-animals through old age. Many of my best cattle were the produce of old cows and old bulls. If a bull turned out well I generally kept him as long as he would live and be useful."

Another prominent breeder, Mr. J. Price, said: "My herd has been bred in-and-in for over eighty years, and by far the greater part of it on a direct line on both sides from one cow, now in calf for the twentieth time. I have bred three calves from her by two of her sons, one of which is the largest cow I have, possessing also the best form and constitution; thus showing indisputably that it is not necessary to mix the blood to keep stock from degenerating."

The finest specimens of the American Merino were the result of inbreeding. Mr. Atwood bred his entire flock from one ewe, and they have been bred in-and-in in the United States for upward of sixty years.

Georg Wilsdorf, a noted German authority, says: "We made the astonishing discovery that the best living animals belonged to families which, when traced back, were found to have all come from a single family, often from a single individual."

Mr. James Wilson, speaking of the Aberdeen-Angus cattle, says: "The inbreeding begun by Hugh Watson was continued, though with less intensity, by his successors." The extraordinary concentration of Old Jock blood in Aberdeen-Angus cattle to-day may be gathered from the fact that it would be impossible to find an Aberdeen-Angus animal born within the last five years which is not descended from Iliad more than once.

Gentry, a famous United States pig-breeder, says: "I have practised inbreeding, more from necessity than from any other reason, for twenty years. If it is true that inbreeding intensifies weakness of constitution, lack of vigour, or too great fineness of bone, as we all believe, is it not as reasonable and as certain that you can intensify strength of constitution, &c., if you have those traits well developed in the animals you are inbreeding?"

Professor Davenport quotes another eminent breeder of Berkshire pigs, Mr. A. Lovejoy, as saying, "We are believers in quite close, even inbreeding. It, of course, requires good judgment in mating animals that are particularly strong in individual merit. Should each have a bad defect, we may expect that to be more manifest in the offspring than in the parents, and likewise the good points would be better. So if one mates equally good specimens the produce will be an improvement. There is no sire so prepotent as an inbred sire. When we get

to the point where we feel the need of outside blood we mate an imported sow with our best boar, and from this litter we select a boar to use on the 'get' of his own sire from other sows on the herd—that is, we breed this boar on his own half-sisters."

Much more evidence might be given that tends to show that the great secret of success in stock-breeding is the result of picking the most valuable strains or families, and conserving these valuable "blood lines" by inbreeding and line-breeding. It is not sufficient to select and breed from the best individuals: it is necessary to select the best families, as amongst their descendants will be found the largest number of fine animals. And it is equally important to know the "bad blood" lines. Mr. Evans, the most successful breeder of Milking Shorthorns in England, says: "In breeding for milk, the bull is more than half the herd. You may buy one that may grade your cattle up, but you may get one that will just as quickly grade them down. I would rather have a moderate bull from a good family than a good bull from a poor family."

Mr. Wriedt said: "There is only one animal in a thousand that really builds up a breed. Hunt up the 'blood lines' that are producing the greatest number of good performers, and perpetuate, multiply, intensify these blood lines by moderate inbreeding, or, if necessary, by the strongest form of inbreeding. If this is combined with stringent selection of only the best animals the breeder cannot fail."

The herd-testing breed societies and the agricultural associations might render most valuable assistance in this way.

The Illawarra dairy cattle are said to all trace back to a Shorthorn bull named Major that was imported over seventy years ago. From existing records steps could be taken to ascertain the influence of the bull on the milk-yield of the progeny, and prizes might be offered for the bull that sired five cows giving the best butterfat-yields in the year.

Mumford, summing up the question as to how long it is safe to continue inbreeding, says: "If we limit the term 'inbreeding' to matings between parent and offspring, or between brother and sister, we cannot escape the conclusion that long-continued inbreeding weakens the constitution and decreases the size. Sweeping generalizations are unwise; but mating animals of diverse characters tends to destroy potency. The crossbred animal is never prepotent."

Major Castleman has said: "Inbreeding has produced some of the finest successes and some of the most dismal failures. We sometimes use it, but feel that in doing so we are playing with fire."

William Haynes, after a most exhaustive inquiry about the inbreeding of dogs, claims that line-breeding has proved to be very much more effective than inbreeding, and that out of ten champion Scotch terriers nine were line-bred and only one of them inbred.

The views of both plant and animal breeders have been materially modified during the past twenty years by the discoveries of the Austrian monk Mendel. It seems strange that Darwin, who made such an exhaustive study of the subject, knew nothing of Mendel's work, though he corresponded with Naudin, who did.

Most plant-breeders agree that advances would have been made quicker had the men who were investigating realized sooner that it was not amongst the first cross, but amongst the second generation, they must look for the individuals which would breed true. According to the Mendelian law, two plants or two animals showing the lower (or recessive) factor in the second generation will breed true at once. By breeding from individuals of the second generation, manifesting the dominant factor, one or more will be found that will breed true. "This," says Hurst, "enables the plant-breeder to dispense entirely with the old and laborious method of fixing by continuous selection, which, though usually effective in the end, is now looked upon as a waste of time."

The same law applies to animals. When red cows are crossed with a black bull it will be found that black calves will be produced in the first generation. Thus black is said to be a dominant factor and red a recessive quality. If these first crosses are mated together the second generation will consist of some black and some red (but not of mixtures of both colours), and the blacks will be about three times as numerous as the reds. Of the three blacks generally one will be pure, and two will be masqueraders or black cattle with still a trace of red blood.

When Red Devons were taken to Ireland and mated with Black Kerry cattle the result of the crossing and recrossing was—(*a*) Some pure black calves; (*b*) some impure masquerading blacks, or black in colour but with red blood in them; and (*c*) some pure reds. The Devons also transmitted their shortness of leg: shortness was dominant over length. As Kerry breeders did not like reds, no attempt was made to keep them; but because of the difficulty of identifying, and so eliminating them (when the impure masquerading blacks, with a trace of red, mated), red calves are occasionally born. Professor R. C. Punnett, F.R.S., points out that pedigree is a rough guide in estimating whether the black bull is a pure black or an impure masquerading black; but that certainty can only be arrived at by the direct test of mating with the recessive red. The same results were obtained when the hornless Suffolk cattle were crossed with the horned red cattle.

Bakewell and others tested their bulls on their neighbour's stock by letting them for a season, at the end of which time they were returned to Dishley. Bakewell's success was attributed to the fact that—(*a*) He was an unparalleled judge of stock; (*b*) he took enormous pains to get the best stock obtainable; (*c*) having secured these, he bred from remarkably close relations; (*d*) he ruthlessly eliminated undesirable stock.

Although Darwin and others failed to recognize it, the work of Mendel threw great light on the subject they were working at. The practical men, the breeders, got good results, but often did not know why, and told people so when asked about their methods. Results could have been obtained more quickly, and at less cost, had they been better acquainted with the discoveries of the scientists. The farmers found out *how*, and the scientists *why*, and the slowness of progress was often because they were working apart in separate watertight compartments.

The late James Little, writing about the development of the Corriedale in New Zealand, states that of his original thirty-one sheep there were only two (one ram and one ewe) that he liked; and he stuck to them as long as he dared—thus working unwittingly in accordance with the views of Mendelian investigators, and with Nilsson, of Svalöf, and other plant-breeders. He was worrying because he could not get a change of blood; but was it not that which enabled him to get his results as quickly as he did? He says he "was haunted by the fear of the results of this constant and unavoidable inbreeding," although inbreeding was practised by the most eminent breeders. He says later: "I do not call a man a breeder who gets fresh blood every year. He may have one or two good sheep every year; yet his flock will show all sorts of types in wool, and will not have that level appearance all flocks should possess." For ten years Mr. Little got good results—most robust and prolific sheep. Then they became delicate in each succeeding generation—began to show more tail, more pig-mouths, and rough hips, and they became subject to all the ills, &c.; but, curiously enough, every year, he said, "I was getting a few, both rams and ewes, better than I ever had." Is not this where Mendelism might have helped him? Was it not because the sheep bred from the masqueraders of the second generation were increasing, while the "better than ever" sheep were the progeny of the pure ones?

Professor Punnett says that this work of analysing the results of breeding is only now beginning; but recent works on heredity throw considerable light on many perplexing problems, such as the skipping of characters for a generation, the persistence of the unwanted "throw-back" in even the most highly pedigreed herds, the curious reversion on crossing, and the meaning of the break-up of the type in the second generation from a cross.

Mendel has given us well-defined laws. It is for the breeder to take advantage of them by study of the breed of animals he is dealing with.

Grassing of Hilly Bush Country.—A bush settler back of Wanganui wrote as follows to Mr. E. Bruce Levy, concerning the first article of his series on the Taranaki back-country, published in the September *Journal*: "I should say, allowing for slight differences in altitude and latitude, that conditions in the Whangamomona district are identical with those that prevail here, hence you can imagine I am looking forward with considerable expectation and pleasure to the rest of the series. Your theory of the tawa and kahikatea climaxes is most interesting—they are well exemplified here. I can show every stage from the kahikateas at the bottom to the beeches on the tops of the ridges. Incidentally, your theory settles a long-standing argument I have had as to the reason the beech slopes do not grass readily. In regard to the failure of forest fires to destroy the seeds of trees on the ground, my experience, such as it is, is that as a rule sufficient attention is not given to the underscrubbing, this being especially the case when the felling is done by contract. I have done my own felling and sowing, and have made a point of cutting everything underneath—ferns and tupari as well as supplejacks and vines. Despite the exceeding wetness of the last two seasons I have had pretty fair burns, while my neighbours have often failed to get a burn at all. I am hoping to get a dry season this year and clean burn to try out your mixtures of seed. My best wishes for the success of your work."

CLOVER-SEEDS.

ECONOMIC SPECIES OF THE GENUS TRIFOLIUM IN NEW ZEALAND.

NELSON R. FOY, Biological Laboratory, Wellington.

THE term "clover" is applied generally not only to members of the genus *Trifolium*, but also to certain members of the genera *Medicago*, *Melilotus*, and *Lotus*. The true clovers, however, are only those which possess the generic name *Trifolium*.

The genus is a large one, there being in all about 275 species in the world, belonging for the most part to the North Temperate Zone. In New Zealand we have about twenty naturalized species, of which only eight or ten are of any economic value. Of these the main ones are: White clover (*Trifolium repens*), alsike (*T. hybridum*), red clover (*T. pratense*), cow-grass (*T. pratense* var. *parenne*), crimson clover (*T. incarnatum*), subterranean clover (*T. subterraneum*), strawberry-clover (*T. fragiferum*), and Egyptian clover (*T. alexandrinum*).

Of these eight species, needless to say, the first five are the most widely used in our grasslands, the last three, particularly Egyptian clover, being the more uncommon. In the following matter the remarks on germination, purity, adulteration, and origin refer in each case to commercial seed.

WHITE CLOVER (T. REPENS).—Synonym, White Dutch Clover.

The seeds are small, 1 mm. to 1·5 mm. in length, regular heart-shaped, flattened, margins rounded, one thinner than the other and between the two on each side a slight depression. Surface smooth and dull or slightly shining. Colour yellow with light or reddish brown, or occasionally tinged with green.

Germination is vigorous, showing at least 90 per cent. in a good average line. Seed under 80 per cent. will be old or immature. In freshly harvested lines there is usually a certain percentage of "hard" seeds* (up to 20 per cent.), so called in consequence of the impermeability of the seed-coat, moisture being unable to pass through. As the seed ages a natural softening takes place, and at times this process is accelerated by means of special "scratching" machines, which make minute incisions in the seed-coat.

White clover is usually fairly high in impurities, both in quantity and variety. The percentage (by weight) varies from 0·5 to 15 per cent., the average being about 2·5 per cent. The main impurities are suckling-clover, alsike, sorrel, rib-grass, red clover, English trefoil, scarlet pimpernel, fat-hen, haresfoot trefoil, mouse-eared chickweed, &c. An unusually high percentage of extraneous seeds in a line is usually made up of suckling-clover, alsike, or, less frequently, clustered clover. Clover dodder is the most dangerous of all possible impurities, but generally this is not common in New Zealand seed.

* Seed-hardness is characteristic of all clovers, but more particularly red clover, cow-grass, alsike, and white clover.

Instances of actual adulteration are rare. When it is practised clustered and suckling clover are the main adulterants used. The seed of clustered clover is almost identical with that of white clover, and its bright-yellow colour adds considerably to the appearance of a dull line of white. As with all seeds, the mixing of good and bad lines is not uncommon.

Practically the whole of the white-clover seed used in New Zealand is grown within the Dominion, particularly in the Canterbury, Marlborough, and Hawke's Bay Districts. Only a small quantity is imported, while our export trade in this seed is assuming considerable dimensions.

FIG. 1. WHITE CLOVER (TRIFOLIUM REPENS). × 10.

[*Photo by E. Bruce Levy.*

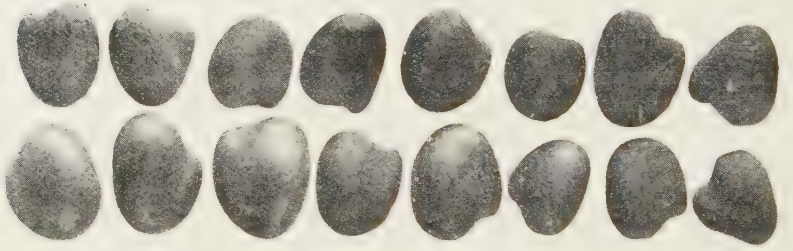


FIG. 2. ALSIKE (TRIFOLIUM HYBRIDUM). × 10.

[*Photo by H. Drake.*

FIG. 3. RED CLOVER (TRIFOLIUM PRATENSE). × 10.

[*Photo by E. Bruce Levy.*

ALSIKE (T. HYBRIDUM).—Synonym, Alsyke.

Alsike is said to be a cross between white and red clover. The seed is of the same shape but slightly larger than that of white clover. Surface smooth and dull. Colour dull yellowish-green to very dark green; some seeds mottled and lighter about the seed-scar.

The average germination is 85 to 90 per cent. A good line should show 90 to 95 per cent.

As with white clover, the percentage of impurities is high, ranging from 0·1 to 10 per cent., with an average of 1·5 to 2 per cent. The main impurities are white clover, English trefoil, timothy, sorrel, suckling-clover, rib-grass, curled dock, camomile, &c. The occurrence of dodder in alsike is extremely rare. In many districts alsike is avoided because of its reputed liability to contain Californian-thistle seed. Some years ago this was undoubtedly true, but at the present time the occurrence of this impurity is comparatively rare.

There is no form of adulteration except seed-mixing. It is of interest to note that before the advent of seed-control in Europe old white-clover lines were dyed green and mixed with alsike as an adulterant.

Very little alsike is grown in New Zealand, practically all our requirements being imported from the United States and Europe.

RED CLOVER (T. PRATENSE).

COW-GRASS (T. PRATENSE VAR. PARENNE).—Synonyms, Mammoth Clover and Perennial Red Clover.

As the seeds of red clover and cow-grass are identical in appearance they will be here dealt with together.

The seeds, 1·5 mm. to 2 mm. in length (average about 1·5 mm.), are roughly triangular or imperfectly heart-shaped—one edge being about one-third longer than the other—flattened, edges rounded, sides convex; a slight depression on each side from the hilum (seed-scar) towards the broad end, the shorter edge being thinner than the long. Surface dull or slightly shining. Colour pure light-yellow to purple, some seeds shading off to violet. A light-brown or tan colour denotes old and dead seed.

The germination percentage is usually high, more especially in colonial seed. A good average line should show from 90 to 95 per cent. Imported seed, as a rule, is slightly lower than this, 85 to 90 per cent. being the average.

In a well-cleaned commercial line the percentage of impurities is low—from 0·1 to 1 per cent., average 0·5 per cent. Colonial seed is in most cases considerably cleaner than the imported, and the impurities present less harmful. The main impurities are rib-grass (very common, and, when the percentage is high, constituting the major portion of the impurities), curled dock, white clover, sorrel, smartweed, English trefoil, and selfheal. Dodder is rarely found in colonial seed, but is not uncommon in imported seed. American seed is characterized by the presence of a high percentage of green pigeon-grass, Rugel's plantain, and timothy; European, by dodder; and English, by cranesbill.

Adulteration, if present, is by means of seed-mixing.

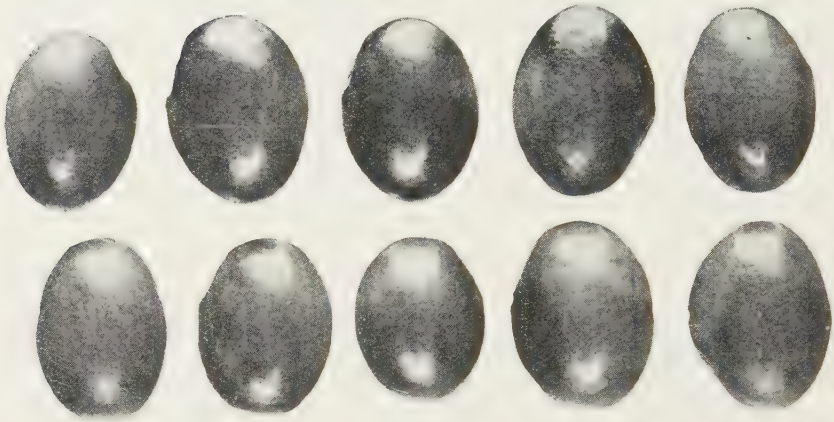


FIG. 4. CRIMSON CLOVER (TRIFOLIUM INCARNATUM). ×10.
[*Photo by E. Bruce Levy.*

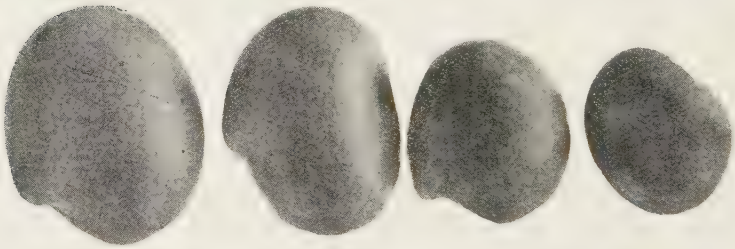


FIG. 5. SUBTERRANEAN CLOVER (TRIFOLIUM SUBTERRANEUM). × 10.

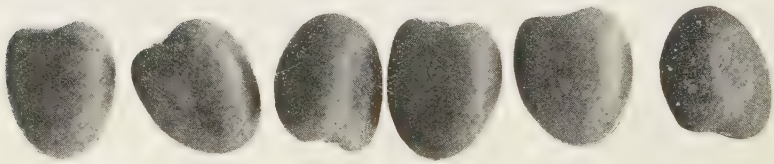


FIG. 6. STRAWBERRY-CLOVER (TRIFOLIUM FRAGIFERUM). × 10.

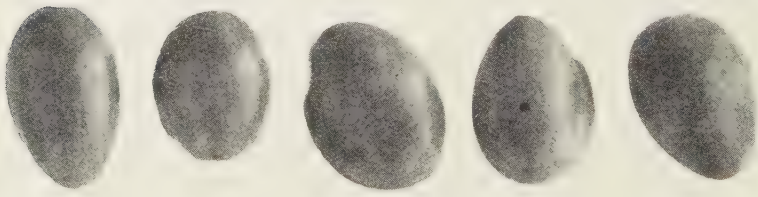


FIG. 7. EGYPTIAN CLOVER (TRIFOLIUM ALEXANDRINUM). × 10.
[*Photos by H. Drake.*

Considerable quantities of seed are harvested in New Zealand, mainly in the Canterbury and Marlborough Districts, with smaller amounts in the Manawatu district. Imported seed generally appears lighter in colour than colonial, which has a heavier and brighter appearance. In New Zealand all colonial red clover—using the name in a general sense—is, as a rule, bought and sold as cow-grass, there being no differentiation between the two seeds when sown and harvested. Cow-grass becomes red clover, and *vice versa*, as the occasion demands.

CRIMSON CLOVER (T. INCARNATUM).—Synonym, Scarlet Clover.

The seeds of crimson clover are fairly large, 1·5 mm. to 2·5 mm. long (average 2 mm.), regular, roughly elliptical in outline, slightly compressed, with the hilum in a slight depression about one-third of the distance on one of the long edges. Surface smooth and shining. Colour buff when new, light to dark brown when old.

The germination of good average seed is 90 to 95 per cent. Newly harvested seeds usually show 90 to 100 per cent. Hard seeds are not common.

On account of its large size the seed is very easily cleaned, the percentage of impurities rarely exceeding 1 per cent. Cut-leaved cranesbill, curled dock, English trefoil, night-flowering catchfly, and field-madder are the most common impurities. Dodder is very rare. Any adulteration is by seed-mixing.

Practically all the seed of this species is imported, mainly from Britain.

SUBTERRANEAN CLOVER (T. SUBTERRANEUM).

The name of this clover is probably derived from the habit of the plant in pushing the ripe seed-pods on the lower stems into the soil.

The seeds are very variable in size—1·5 mm. to 3 mm. in length—roughly triangular, with one of the longer sides shorter than the other, and between the two a slight groove on each side. Seed slightly compressed, and much rounded at the end opposite the side bearing the hilum. Surface smooth, dull, or scarcely shining. Colour black, with the faintest tinge of a reddish-purple; some seeds almost of a dark plum colour. Seeds frequently enclosed in a thin membraneous envelope.

Germination is usually not very vigorous, 70 to 80 per cent. being the average. An unusually high percentage of hard seed is always present, which necessarily lowers the germination capacity.

Subterranean clover is easily dressed, and consequently has few impurities. Curled dock and English trefoil are the most common; dodder is very rare. Seed-mixing is the form of adulteration, if any.

All the Dominion's requirements of this clover are imported from Britain and Australia.

STRAWBERRY-CLOVER (T. FRAGIFERUM).

This clover is so called on account of the resemblance of the seed-heads to a fruiting strawberry.

The size of the seed is about 1·5 mm. to 2 mm.—average 2 mm. Shape regular, roughly triangular, rounded at apex, flattened, with a

IMPURITIES OF CLOVER-SEEDS.

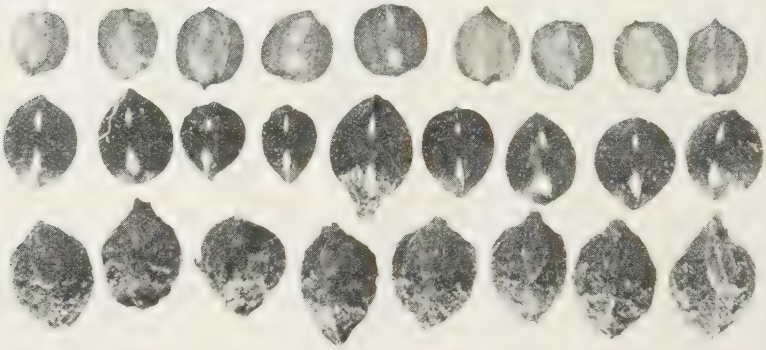


FIG. 8. SORREL (RUMEX ACETOSELLA). × 10.

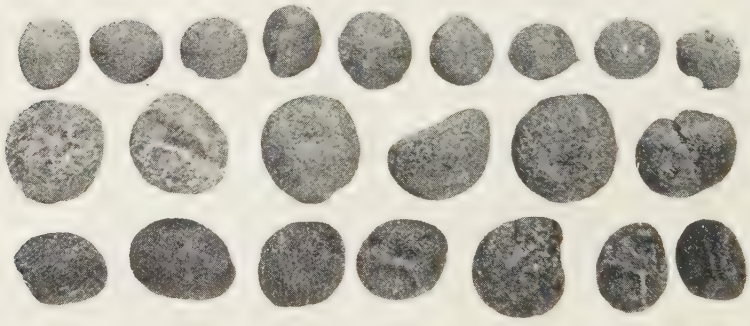


FIG. 9. DODDER (CUSCUTA SPP.). × 10.

FIG. 10. CURLED DOCK (RUMEX CRISPUS). × 10.

[*Photos by E. Bruce Levy.*

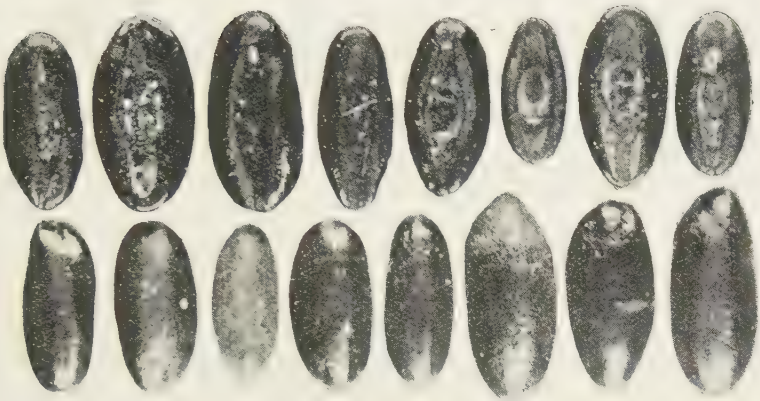


FIG. 11. RIB-GRASS (PLANTAGO LANCEOLATA). × 10.

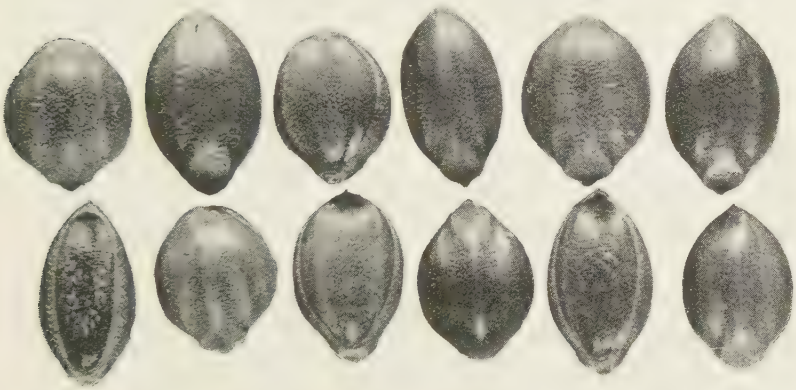


FIG. 12. GREEN PIGEON-GRASS (SETARIA VIRIDIS). × 10.

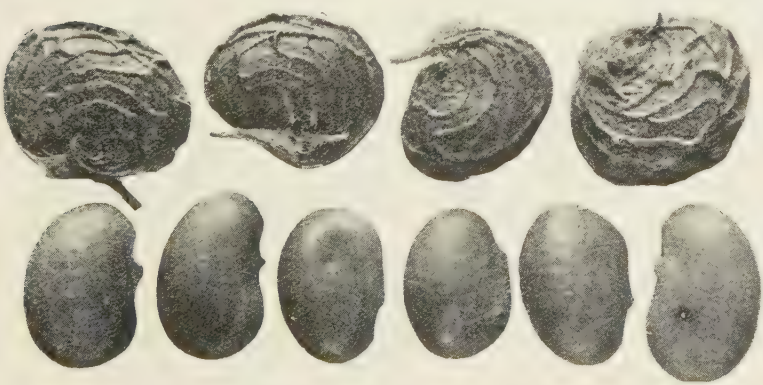


FIG. 13. ENGLISH TREFOIL (MEDICAGO LUPULINA). × 10.

[*Photos by E. Bruce Levy.*

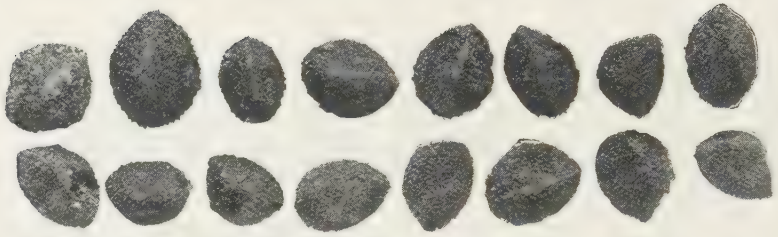


FIG. 14. SCARLET PIMPERNEL (ANAGALLIS ARVENSIS). × 10.

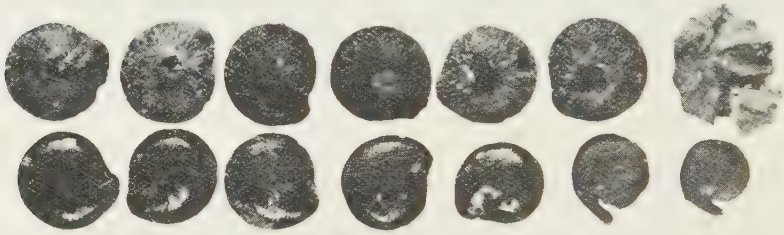


FIG. 15. FAT-HEN (CHENOPODIUM ALBUM). × 10.

FIG. 16. SELFHEAL (PRUNELLA VULGARIS). × 10.
[*Photos by E. Bruce Levy.*

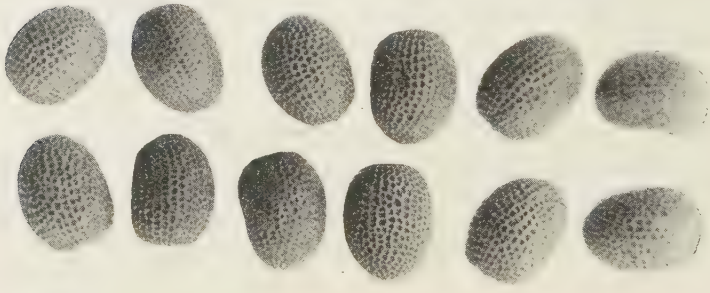


FIG. 17. CUT-LEAVED CRANESBILL (GERANIUM DISSECTUM). × 10.
[*Photo by H. Drake.*

slight groove running down between the two longer sides. Margins rounded, hilum on the shortest side. Surface smooth and dull. Colour rich yellow to light brown or green, and mottled with dark green. A brown colour denotes old seed.

A good line will germinate up to 95 per cent., and the average is 80 to 90 per cent. Hard seeds are common.

The percentage of impurities is not high, being from 0·1 to 2 per cent., with an average of 0·5 per cent. Rib-grass, curled dock, and sorrel are the main impurities. Dodder is not common.

Strawberry-clover may be adulterated with white clover, but this is not usual.

Australia is the source of origin of our importations of this species.

EGYPTIAN CLOVER (T. ALEXANDRINUM).—Synonym, Berseem Clover.

The seeds are 1·5 mm. to 2 mm. in length, averaging 1·5 mm. Shape regular, roughly triangular, slightly compressed; faintly marked groove between the two long margins, the apex of same being very much rounded. Surface smooth and half-shining. Colour light to dark brown, with a faint tinge of green.

A good average line should show 80 to 90 per cent. germination.

The seed is usually very pure, the average percentage of impurities being only 0·5 per cent. Rib-grass, curled dock, and English trefoil are the main impurities.

Adulteration takes the form of seed-mixing.

Australia also supplies our requirements of this clover.

SOME SUB-ECONOMIC SPECIES.

The following *Trifolium* species are usually regarded more or less as weed clovers: Suckling-clover (*T. dubium*), clustered clover (*T. glomeratum*), haresfoot trefoil (*T. arvense*), and low hop trefoil (*T. procumbens*).

SUCKLING-CLOVER (T. DUBIUM).—Synonyms, Little Trefoil and T. minus.

Seeds are 1 mm. to 1·5 mm. in length, elliptical, slightly laterally compressed; margins rounded, one being narrower than the other; hilum on flattened portion of narrow margin; a light-coloured depression extends downwards from the hilum on either side. Surface smooth and shining. Colour light yellow to pale brown.

Suckling-clover is a common impurity of white clover. It is occasionally used as a pasture-constituent, especially on poor rough country.

CLUSTERED CLOVER (T. GLOMERATUM).—Synonym, Cluster Clover.

The seeds are 1 mm. in length, imperfectly heart-shaped, and laterally compressed; margins rounded, one being thinner and shorter than the other; hilum in slight indentation on the narrow margin; on either side a light depression extends from the hilum. Surface covered with minute projections, giving the seed a dull appearance. Colour light yellow to pale brown.

This species is a not uncommon impurity of white clover, and a possible adulterant.

HARESFOOT TREFOIL (T. ARVENSE).—Synonym, Rabbit-foot Clover.

The seeds are 1 mm. to 1·5 mm. in length, elliptical, slightly laterally compressed; margins rounded, one being thinner than the other; hilum on flattened portion of the thinner margin; on either side a dark-coloured depression extends from the hilum. Surface smooth and shining. Colour light apple-green to light brown.

Haresfoot occasionally occurs as an impurity of Canterbury white clover.

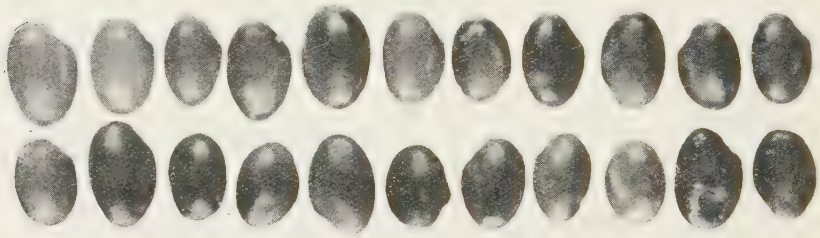


FIG. 18. SUCKLING-CLOVER (TRIFOLIUM DUBIUM MINUS). × 10.
[*Photo by E. Bruce Levy.*

FIG. 19. CLUSTERED CLOVER (TRIFOLIUM GLOMERATUM). × 10.
[*Photo by H. Drake.*

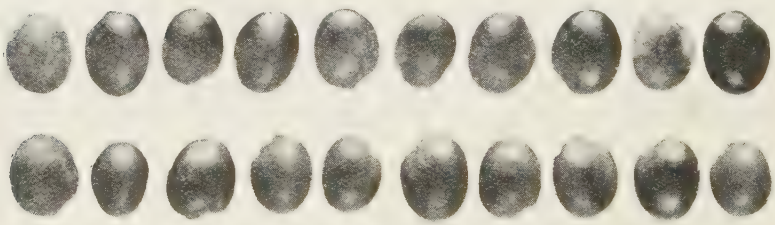


FIG. 20. HARESFOOT TREFOIL (TRIFOLIUM ARVENSE). × 10.
[*Photo by E. Bruce Levy.*

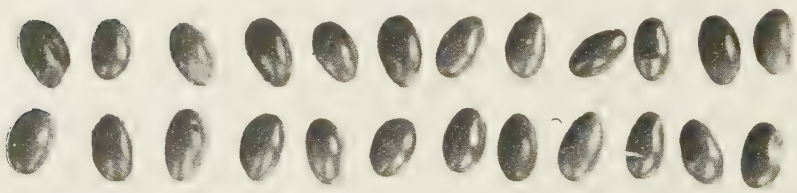


FIG. 21. LOW HOP TREFOIL (TRIFOLIUM PROCUMBENS). × 10.
[*Photo by H. Drake.*

LOW HOP CLOVER (T. PROCUMBENS).—Synonym, Hop Clover or Trefoil.

The seeds are 1 mm. in length, long elliptical, slightly laterally compressed, margins rounded; hilum on flattened portion of one margin; on either side a light-coloured depression extends from the hilum. Surface smooth and shining. Colour pale yellow to pale brown.

This clover is very like suckling, only smaller and longer in proportion to the width. It is a rather rare impurity of white clover.

BLACK-SPOT OF APPLE AND PEAR.

EXPERIMENTS IN POSSIBLE METHODS OF REDUCING INFECTION.

K. M. CURTIS, M.A., D.I.C., D.Sc., Mycologist, Cawthron Institute of Scientific Research, Nelson.

FOR some time now it has been definitely known that in New Zealand the fungi causing black-spot of apple and pear live through the winter in the vegetative stage in the dead fallen leaves, and during the late winter and early spring gradually develop reproductive bodies known as ascospores, which, on being liberated as the buds of the tree unfold, cause a certain proportion of the initial infection of the new season.

In addition to the subsidiary factor of temperature two chief factors govern the discharge of these ascospores, from the chambers in which they are produced, into the air. These two factors are the maturity of the ascospores and the presence of moisture. In exceptional cases immature ascospores are discharged, but as a rule they are retained in the leaf until they have reached their full size; once they are full-grown, however, the presence of sufficient water secures their discharge. In districts, therefore, in which rain may be expected about the time the blossoms unfold, the part played by the ascospore might prove of vital significance in establishing at the beginning of the season a widely spread series of infections which will reproduce in geometrical ratio during the remainder of the season. In districts in which the spring is dry the ascospore probably plays a smaller part in establishing the season's infection. But in districts, such as Nelson, with a fairly heavy spring rainfall it is a question of importance to know what proportion of the total initial infection is caused by the ascospore, so that if the proportion is large some means may be evolved to cope with this danger. This proportion, of course, would not be constant, for many extraneous factors enter into the question.

Three of the more important extraneous factors are concerned with the number of leaves present on the ground having ripe ascospores to eject at the time of rainfall; with the possibility that the lower surface of the leaves from which by far the greatest number of ascospores come faces downwards at the time of spore-ejection instead of upwards, so that the ascospores are not caught up into the air-currents; and with the possibility that the wind may be blowing

in the wrong direction at the time, or be so strong that the ascospores are prevented from falling uniformly on the trees experimented with. Such accidental factors as these naturally prevent the possibility of the proportion of ascospore infection to the total initial infection being determined with accuracy. But the range of the proportions, if determined for several cases, would give an almost equally useful working knowledge of what may be expected to take place.

It was with the object of securing an idea of what this range actually is that an experiment on a rather large scale was carried out in an apple-orchard on the Moutere Hills. The writer is indebted to Mr. George White both for the use of the orchard for this experiment and for his care in carrying out the details of the practical work.

EXPERIMENT I: TO DISCOVER WHETHER ASCOSPORES FROM DEAD LEAVES PLAY AN IMPORTANT PART IN CAUSING INITIAL INFECTION EACH SPRING.

Two plots were involved in this experiment—the experimental block proper and a control block—each consisting of 6 acres. In the one block the leaves were removed by raking them into rows between the trees and burying them; in the control block they were left on the ground as they had fallen. The object of the experiment was to compare the initial amount of black-spot in the two blocks. The apple varieties comprised Worcester Pearmain, King David, Sturmer, Munro, Statesman, and Delicious.

Treatment: The trees were hoed round in May, and all grass and bracken were removed. The orchard was twice harrowed diagonally to make the ground as smooth as possible. Leaf-fall was complete about July, when the trees were pruned and the prunings removed.

In the experimental plot the leaves were raked both from the base of the trees and from the space between the adjacent trees of the same row, so that finally all the leaves were gathered into unbroken parallel rows running from one end of the block to the other. The tools used were ordinary garden-rakes with a thin steel scraper attached to the back. The raking of the leaves was begun on 29th July and finished on 3rd August. When the raking was finished the leaves were ploughed under. In ploughing, which was "off," twelve furrows were turned, all but the last on either side being 14 in. wide and 7 in. deep. The last furrow, which turned no leaves under, as it was made on the cleared area, was 14 in. by 5 in. The plough used was a heavy 99 Oliver with an ordinary short mouldboard and a skim-coulter. For the last two rows a chain and 18 in. extension were used in order to get close under the trees. The strip left unploughed between the trees was 12 in. to 18 in. wide.

Later cultivation: Ordinary medium-weight tine harrows were used to maintain a soil mulch of about 3 in.

Spray treatment of the blocks: The experimental and control areas were both divided into five parts, those of the experimental block being numbered 1 to 5, and the corresponding blocks in the control area 1A to 5A (Fig. 1). The blocks were so chosen that 1 and 1A contained as many varieties in common as possible; similarly with 2 and 2A, &c.

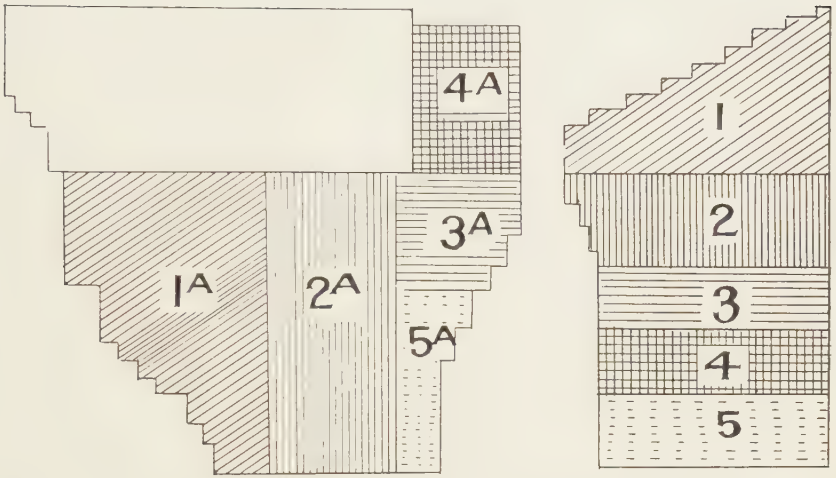


FIG. 1. BLOCKS 1–5 AND 1A TO 5A IN THE BLACK-SPOT EXPERIMENT ON THE MOUTERE HILLS.

The number of trees examined in the various blocks is as follows: Block 1, 115 trees; block 2, 94 trees; block 3, 56 trees; block 4, 56 trees; block 5, 56 trees; block 1A, 151 trees; block 2A, 78 trees; block 3A, 44 trees; block 4A, 50 trees; block 5A, 33 trees.

The spray treatment given to block 1 was the same as that given to block 1A; similarly, that given to 2 as to 2A; and so on.

Blocks 1 and 1A received four sprays; blocks 2 and 2A received three sprays; blocks 3 and 3A received two sprays; blocks 4 and 4A received one spray; blocks 5 and 5A received no spray.

The spray used in every case was lime-sulphur. The dates of application and the strength of the spray are given in the following table:—

Dates of Application of Spray.	Blocks.				
	1, 1A.	2, 2A.	3, 3A.	4, 4A.	5, 5A.
7th September	1–15	..	..	..	..
12th September	1–15	1–15	..	..	..
29th September	1–15	1–15	1–15	..	..
12th October	1–40	1–40	1–40	1–40	..

The taking of the records was begun on 28th October, and continued daily until completed. The number of diseased twigs per tree was counted, one diseased leaf being considered sufficient to constitute a diseased twig. The total number of diseased twigs for each variety in the block was determined; this number was divided by the number of trees of that variety in the block, and thus the average number of diseased twigs per tree was secured for each variety.

The final results showing the average number of diseased twigs per tree for each variety is given in the following table. Blank spaces indicate that the particular variety did not occur in the block in question.

Block.	Worces. P.	Statesm.	Stursm.	Delic.	Munro.	King D.	Average.
1	·07	2.	5.	6.			3.
1A		5.	21.	18.	20.	70.	31.
2	·25	·5.	10.	7.			6.
2A		19.	21.	27.	25.	44.	28.
3	·3	4.	6.	12.			4.
3A		17.			40.	85.	45.
4	·7	5.	8.	47.			8.
4A		24.	48.		51.	183.	82.
5	·5	8.	12.	38.	7.	55.	24.
5A.	5·3		64.	36.	40.	105.	83.

In every variety the figures for the 1A–5A series should be compared with those for the 1–5 series; by this means is obtained the amount of infection when ascospores are free to play their part in causing infection, and the amount of infection on trees similarly treated and of the same variety when ascospores are not free to cause infection.

As was to be expected, the ratio of the number of diseased twigs in the one series to that in the other series varies in the different varieties. The maximum and the minimum ratios are exhibited by the Sturmers. The maximum is shown by this variety in blocks 4A and 4, where the ratio is 6 : 1; and the minimum in blocks 2A and 2, where the ratio is (roughly) 2 : 1. The other varieties show intermediate values in the ratio. The number of trees involved in this experiment is fairly large, and the averages can therefore be accepted as more or less typical. If, then, the minimum reduction in infection through control of the leaves is one-half, it is obvious that control of the fungus in the leaves is a phase in the campaign against black-spot that we cannot afford to overlook.

A double question then arises, as to what is the most effective means of dealing with the leaves, and, secondly, whether that means is practical. An attempt to solve the question was made in the following experiment.

EXPERIMENT II: TO DETERMINE THE RELATIVE VALUES OF BURNING AND OF BURYING THE LEAVES FOR THE PREVENTION OF ASCOSPORE INFECTION.

This experiment was carried out on one variety of apple—Etowah—a block of which was placed at the writer's disposal through the kindness of Mr. H. E. Stephens, of Stoke. Forty-eight trees in three rows, with sixteen trees in each, were used in the experiment. The area was divided transversely to the direction of the rows into three blocks: Block A, five trees per row; block B, five trees per row; and block C, six trees per row (Fig. 2). In block A the leaves were raked from beneath and from between the trees into a series of heaps arranged in parallel lines between the rows of the trees. In block B they were raked out as in block A, but instead of being gathered into heaps they were spread evenly in parallel rows between those of the trees. In block C the leaves were not touched; this block therefore acted as control to the two others. The leaf-heaps in block A were then burnt, after which all three blocks were ploughed (in one direction).

Result: The counting of the number of diseased twigs on the trees was begun on 28th October. The average number of diseased

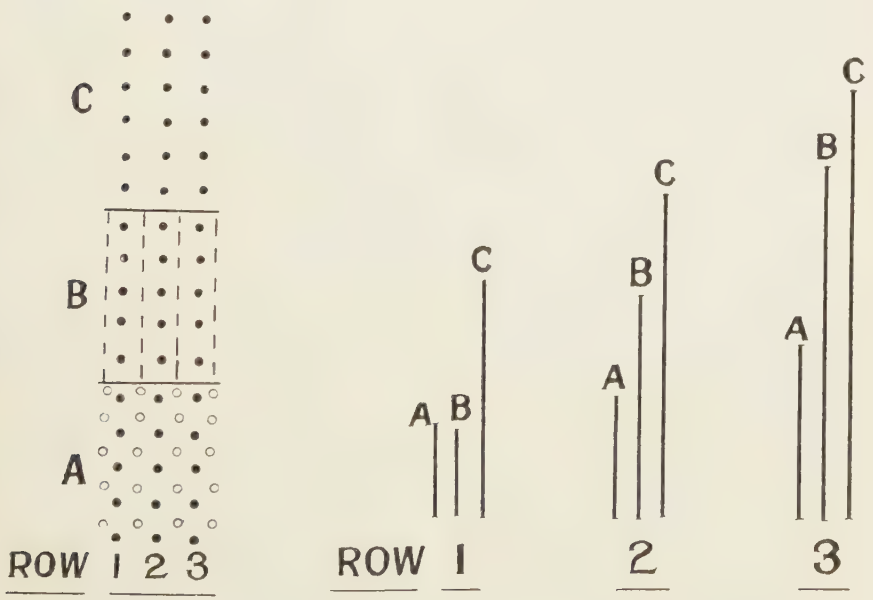


FIG. 2. CONTROL OF BLACK-SPOT INFECTION BY LEAF-BURNING AS COMPARED WITH THAT BY LEAF-BURYING.

A, leaves burned; B, leaves buried; C, leaves untouched. The height of the columns on right indicates the relative amounts of infection.

twigs was:—In block A: row 1, 11·7; row 2, 16·75; row 3, 23·6. In block B: row 1, 11·4; row 2, 31·25; row 3, 49·8. In block C: row 1, 32·5; row 2, 45·4; row 3, 60·3. Therefore the ratio of the average number of infected twigs for the three blocks is roughly: A : B : C = 17 : 31 : 46.

There was therefore least infection in block A, next in block B, and most in block C. With one exception the number of diseased twigs in each row also increased from A to B to C. This exception is in row 1, block A, where there were 11·7 diseased twigs, as compared with 11·4 in block B of the same row. This apparent irregularity, however, is probably to be explained by the fact that two trees were missing from the A part of the row, and that the three that were present in that part were larger than any others in the remainder of the row.

The result of this experiment shows that burning the leaves is more effective than burying them, and, incidentally, as in the previous experiment, that burying the leaves is better than leaving them free on the surface. Unfortunately, however, it was found that raking the leaves from beneath the trees and burning them took too much time. We have therefore to seek some other method, which, while retaining effectiveness in controlling infection from the leaf, can be incorporated more easily into the regular routine of orchard practice. With this object in view a third experiment was undertaken, this time in part of the orchard of Mr. R. Highet, of Stoke.

EXPERIMENT III: TO TEST THE VALUE OF SPRAYING THE DEAD LEAVES TO PREVENT ASCOSPORE INFECTION.

The apple-trees lent for this experiment consisted of a block of Premiers growing on rather low ground. The area was divided into three blocks—A, B, and C (Fig. 3). The trees themselves in all three blocks were sprayed alike, but, in addition, the leaves on the ground in A received three special sprays, in B one special spray, and in C none.

The dates of the special sprays were: In A, 15th September, 15th October, and 26th October; in B, 26th October.

In the average year the majority of the ascospores are discharged within about ten days before and after the beginning of October. As it happened, it was not possible to choose days for spraying that lay within the critical twenty days. For it will be seen that 15th September was early, as many of the ascospores would be immature at that time; 15th October, although near the end of the critical period, was a little late; while 26th October was distinctly too late to show the full possibility of the spray. When ascospores are mature their discharge is dependent on the presence of moisture. At the time of this experiment rain fell on September 10–13, 22–27, and on October 4–8, 12–13, and 21. In addition, therefore, to the normal danger to be expected during the end of September and beginning of October, two exceptionally prolonged rainy periods occurred within that time, and a correspondingly large discharge of ascospores may be expected to have taken place then. So that it is probable that the control by spraying would have been more marked than it proved to be had the ground sprays been applied during the critical period.

But, even as it was, definite control was obtained. The average number of diseased twigs per tree was: In block A, 77; in block B, 187; in block C, 195.

The single spray given to B on 26th October was evidently much too late, as there is little difference in the averages of B and C. Block A, however, with its three sprays, showed a marked reduction in infection, and the control in this case is really greater than the figures indicate, for block A lies lower than B and C, and Mr. Highet states

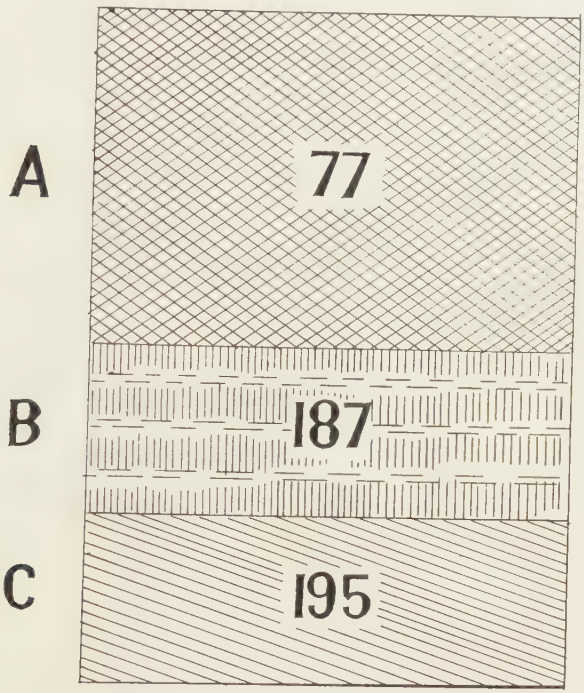


FIG. 3. REDUCTION OF BLACK-SPOT INFECTION SECURED BY SPRAYING THE DEAD LEAVES ON THE GROUND.

A, dead leaves sprayed three times; B, once; C, not at all. Average number of diseased twigs per tree is shown in the figures.

that until the year of the experiment he has always had more black-spot in A than in B or C.

From this experiment it is concluded that spraying the leaves offers promise of a simple practical means of materially reducing infection. In most cases there would be no need for a special mixing of the spray. Except after unusually wet weather the dead-leaf spray need be given only when the normal sprays are being applied to the trees. In the ordinary course of events the leaves on the ground, of course, receive an appreciable amount accidentally when the trees are being sprayed. All that would be required in the normal season is that a little extra time should be devoted to coating the dead leaves thoroughly. When

the spray is being applied to the fallen leaves the force of the pump turns the majority of them over, so that many are sprayed on both sides. As the critical time in the average year extends, roughly, from the beginning of the last week in September to the end of the first week in October, the application of the dead-leaf sprays should be made during this time. If the rainfall that is normally to be expected then (Nelson) is delayed, as happened this season, the dead-leaf spray would naturally be postponed until the rain had come. Application of the spray three or four days before rain does not necessarily prevent the discharge of living ascospores; maximum effectiveness of the spray is secured only when it is applied *immediately after rain*.

LIMING FOR WESTLAND SOILS.

2. TESTS ON THE HEAVIER LANDS.

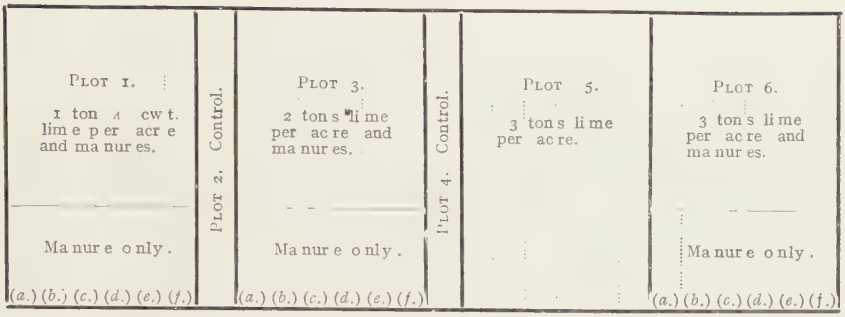
C. S. DALGLIESH, Fields Instructor, Hokitika.

In an article published in the *Journal* for May, 1923, the writer gave an account of experiments carried out at Waimaunga Experimental Farm, on lands fairly representative of the lighter soils of the South Island west coast, which clearly demonstrated the marked improvement in root crops and subsequent pasture on such soils treated with lime, as against no lime or treatment with manures only. That this applies in equal degree to the heavier soils seems to be also clearly shown by tests carried out in other parts of the district, of which the following are examples.

A GREY COUNTY EXPERIMENT.

A trial with lime and manures was undertaken in February, 1920, on Mr. C. Ball's farm, at Rotomanu. Mr. Ball had then been in possession for eighteen months, and the cultural history of the land up to that time was not reliably known. The land is heavy silt drained swamp, and at the time of taking possession was lying fallow, having previously been cropped to some extent.

In the spring of 1920, under ideal weather conditions, the land was ploughed and given good cultivation, and sown in oats together with a grass-mixture, 2 cwt. of superphosphate per acre being used as a fertilizer. The result was a complete failure, the oats being patchy and stunted in growth, while the grass, after brairding quite satisfactorily, rapidly died out. An area of 1 acre was then taken in hand for experimental purposes. After being ploughed in January, 1921, and well worked up, the land was sown in a grass-mixture of perennial rye-grass, 12 lb.; Italian rye-grass, 8 lb.; cocksfoot, 6 lb.; timothy, 4 lb.; cow-grass, 3 lb.; alsike, 2 lb.; white clover, 1 lb.; and Lotus major, 1 lb.: total, 37 lb. per acre. Lime and manures were applied according to the following scheme:—


Plot 1.
1 ton 4 cwt. lime per acre and manures.
Manure only.
(a.) (b.) (c.) (d.) (e.) (f.)
Plot 2. Control.
Plot 3.
2 tons lime per acre and manures.
Manure only.
(a.) (b.) (c.) (d.) (e.) (f.)
Plot 4. Control.
Plot 5.
3 tons lime per acre.
Plot 6.
3 tons lime per acre and manures.
Manure only.
(a.) (b.) (c.) (d.) (e.) (f.)

Plots 1, 3, and 6 were treated with manures as follows, each manure being applied at the rate of 3 cwt. per acre: (*a*) basic slag, (*b*) superphosphate, (*c*) blood-and-bone, (*d*) basic superphosphate, (*e*) equal parts superphosphate and basic slag, (*f*) equal parts superphosphate and blood-and-bone.

The reason of the failure of the previous sowing of grass and oats was very evidently the necessity for lime in the soil. All the limed plots in the test acre made vigorous growth from the commencement, and excellent pasture was rapidly established on them. On the control plots, and plots with manure only, the seed germinated but made no further headway, and the ground soon became covered with lesser bog-rush (*Juncus uliginous*).

Plot 1, which received the smallest quantity (24 cwt.) of lime per acre, in comparison with the other limed plots was backward in growth for the first twelve months, but has made steady improvement, and is now equally as good. Plot 5 (3 tons lime per acre) equals in quality the limed plots which received lime and manure. This is no doubt due to the heavy dressing applied. The control plots and plots with manure only carried little else than the small rush for the first twelve months. Yorkshire fog and Lotus major have now taken possession. Fig. 1 is representative of the limed plots, and Fig. 2 represents the control plots and plots with manure only. The latter shows the growth of fog, while on the limed plots better grasses and clovers are abundant.

The whole test area has been consistently grazed, except when reserved for hay in the summers of 1921 and 1922. The pasture is now very satisfactory, and well ahead of grasslands sown about the same time on better-class land in the district.

The remaining portion of the field lay fallow from the time of the failure of the pasture and oat crop in the spring of 1920 until the spring of 1922. It was then ploughed during early October, cultivated, and sown to pasture in December, a mixture similar to that employed in the experimental trial being used. One ton of lime per acre was applied. One acre was reserved for a trial with Nauru raw rock phosphate, and treated as follows: Plot 1, ½ acre, 3 cwt. Nauru phosphate per acre; plot 2, ¼ acre, 1 ton lime and 3 cwt. of Nauru phosphate per acre; plot 3, ¼ acre, ½ ton lime and 3 cwt. Nauru phosphate per acre. Weather conditions were very unfavourable both before and after the sowing.

FIG. 1. SHOWING PART OF LIMED PLOTS ON MR. BALL'S FARM, WITH GOOD GROWTH OF CLOVERS AND BETTER GRASSES.

FIG. 2. REPRESENTATIVE OF UNLIMED PLOTS AND PLOTS WITH MANURE ONLY, YORKSHIRE FOG AND LOTUS MAJOR BEING THE PREDOMINANT GROWTHS.

[*Photos by C. S. Daigleish.*

Plot 1 (Nauru phosphate only) made a very poor showing; the seed germinated, but growth was poor, stunted, and a bad colour; the grass very soon completely died out, and sorrel is now in possession. Plot 2 and plot 3 (lime and Nauru phosphate) show a decidedly good pasture, which promises well and has been kept closely grazed. No difference is apparent between these two plots, but both show an improvement on the main field, which received lime at the rate of 1 ton per acre, but no fertilizer. Clovers are showing prominently to more advantage.

TEST AT WESTPORT.

At Westport, in the spring of 1918, two grass-mixtures were sown on river-flat formation. Lime was applied at the rate of 2 tons per acre, except ½ chain through the centre of the area, which was left unlimed. Since the time of sowing there has been a continuous first-class pasture, hay being harvested every season. Lime in this instance showed no appreciable improvement until the summer of 1922–23, when the hay crop gave an increase yield of 17·6 per cent. on the land limed over the unlimed land.

PASTURE TOP-DRESSING TRIAL IN SOUTH WESTLAND.

At Waitaha, South Westland, a trial in top-dressing old pasture was undertaken in the spring of 1922–23. The test area comprises a twenty-three-year-old pasture originally sown in perennial rye-grass, cocksfoot, timothy, and clovers. At the time of top-dressing timothy was most prominent, and cocksfoot lightly distributed over the area, with rye-grass and clovers in places. The land is heavy, and carries a fair quantity of rushes, which were mown previous to top-dressing. The area was divided into three plots and treated as follows: Plot 1, 1 ton lime per acre; plot 2, 5 cwt. Nauru rock phosphate per acre; plot 3, 5 cwt. basic slag per acre.

All dressings show an improvement on the old pasture. The limed plot shows to most advantage up to the present, and has given remarkably good results for the period. Basic slag comes next, but is not so pronounced as the lime. Nauru phosphate shows an improvement, but not so marked as the slag. Stock have always shown a preference for the limed plot.

These examples of the beneficial effects of lime are, as already indicated, not isolated cases, but correspond to the experiences of many Westland farmers. The quantity of lime that requires to be applied to the soils of the district is by no means a fixed one: it greatly depends on the nature of the land. On the lighter lands ½ ton per acre will give profitable returns, while on the heavier lands this quantity is not sufficient. At Waimaunga Experimental Farm, Grey Valley, limings ranging from 5 cwt. to 1 ton per acre are being given a trial in the current season.

Lucerne Inoculation.—When procuring inoculated soil in connection with the establishment of lucerne, care should be taken that such soil is well impregnated with the organisms (denoted by abundance of root-nodules), and preferably from a lucerne-stand not less than four or five years old.

RABBIT-POISONING WITH STRYCHNINE.

VARIOUS BAITS AND METHODS.

Live-stock Division.

(1.) CARROTS AS BAIT.

POISONING in this form is very effective in winter, when the carrots are fresh and crisp. If carrots are allowed to become soft and dry, the rabbits do not eat them so well. The methods adopted are as follows :—

(a.) *Strychnine and Sugar sprinkled.*

Cut up 15 lb. of carrots into small cubes, add 1 lb. of icing-sugar, and drain off any liquid after sugar has dissolved. Lay the sweetened cubes in light plough-furrows or scrapes, two cubes every 4 yards apart. Feed in this manner for three nights, and if the rabbits eat the carrots proceed as follows : Cut up 12 lb. of clean carrots into small cubes, add 1 lb. of icing-sugar, and allow carrots to drain until all surplus liquid runs off ; grind 1 oz. of strychnine into fine powder, and sprinkle a teaspoonful at a time over the carrots until the ounce is all mixed, stirring well after each application of strychnine ; then add 1 lb. of icing-sugar to cover taste of strychnine, and allow carrots to stand for two hours before laying. One poisoned cube every 3 yards is sufficient.

(b.) *Strychnine and Sugar Paste.*

Commence operations by free-feeding the rabbits for two nights in succession with unpoisoned carrots, laid 3 ft. to 4 ft. apart in plough-furrows, scrapes, or spade-chips freshly made. The advisability of liberal free-feeding for at least two nights is strongly recommended—in fact, it is practically essential to success. The baits in free-feeding should be similar to those which are poisoned, and should be laid in the same way. If the baits free from poison are well taken, lay the poisoned carrots on the third day. It has been found advisable to put out about four times the quantity of free-feed as compared with that poisoned. The poisoned baits should be laid from about 6 ft. to 9 ft. apart, according to the infested state of the land.

The mode of preparing the poison is as follows : To 1 oz. of strychnine-crystals add 2 oz. of icing-sugar, and after thoroughly mixing this add enough water to make a thick paste. (Note that the strychnine-crystals will require to be powdered before adding the sugar.) A 4 oz. bottle with wide neck and glass stopper is most suitable for mixing the poison.

When ready to commence laying, have the carrots clean, not washed. Cut the carrot straight across the top with a clean knife, smear the top of the carrot with a little of the poisoned paste, and immediately commence slicing off the baits, so that each bait will have at least a smear of the poison. When all the smeared part is cut from the carrot again apply the paste as before. The baits should be thin, not more than $\frac{1}{8}$ in. thick and about $\frac{3}{4}$ in. across. Each bait only requires a very small portion of the paste-smear (poison).

It is preferable to lay the poisoned baits in the afternoon, and if rain comes on and the result is spoiled in consequence, immediately relay when the weather is again fine. All stock should be removed before poisoning, and if any poisoned baits are left after two or three days gather up and bury. Carrots should be of good quality and clean cut, not bruised.

(c.) *Method for Large Quantities.*

When large quantities are being dealt with the carrots may be cut into cubes by being placed in a strongly made box and chopped up with a spade, then put through a sieve to take out the larger pieces for rechopping. The method of mixing the chopped carrots and sugar (without strychnine) is to place alternate layers of carrots and sugar in the box, and thoroughly stir up and mix together. When the poisoned baits are being prepared, mixing is done in the same way, with the addition of a sprinkling of powdered strychnine on each layer of carrots and sugar, the whole being thoroughly mixed together before removing from the box, so that each piece of carrot may get its share of the strychnine. If this mixture is considered by the user to be too strong it can be weakened by the addition of a few pounds more carrots.

Minced carrots are sometimes used instead of the chopped-up article, and where laid fresh, results have been found satisfactory.

NOTE.—Apples and swede turnips have been successfully used in place of carrots in the foregoing methods.

(2.) OATS AND MOLASSES AS BAIT.

This method has proved very effective, satisfactory kills having been made, and it can be used at any season of the year. It has been tried when there was plenty of pasture, also when feed was scarce, and in both instances results were good. The method is as follows :—

Boil 15 lb. of oats (Garton's preferred) with 2 lb. of molasses or treacle and sufficient water until the oats are soft, draining off any surplus liquid. The oats are then ready to lay for feeding purposes. Run light plough-furrows about 2 chains apart on the land where rabbits feed principally at night, and lay baits of a dessert-spoonful every 4 yards apart in the furrows. In country too rough for the plough lay the baits in scrapes or spade-chips. Continue this for three nights, and if the rabbits are then eating the sweetened oats well, proceed with the poison as follows : Weigh out 24 lb. of boiled oats treated as before mentioned ; pour into a wide bath or tub ; grind 1 oz. of strychnine into fine powder, and sprinkle a teaspoonful at a time over the oats, stirring well after each sprinkling until the strychnine is all mixed ; after which add 2 lb. of sugar to give a sweet coating, as the rabbits having been fed on sweetened oats it is advisable to cover the taste of the strychnine.

Allow the oats to stand for two hours before laying. In laying the poisoned oats one teaspoonful is sufficient every 4 or 5 yards. The furrows used for feeding purposes will also do for the poison.

(3.) GENERAL POINTS.

Special care should be taken that all utensils used in the preparation of the poison are perfectly cleaned, and personal cleanliness should be observed and the baits handled as little as possible. It is held by some that the addition of a small quantity of oil of aniseed to the poison immediately before laying is of advantage in attracting rabbits to the bait, and also in destroying all traces of human handling. The strychnine should be ground as fine as possible, no grittiness to be observable.

As strychnine is highly poisonous, the hands require to be thoroughly washed after the poison has been handled.

STEEPING TURNIP-SEED IN TURPENTINE.

In connection with the method of steeping turnip-seed in turpentine before sowing, with the object of warding off attacks of the "turnip-fly," a question has been raised as to the effect of such steeping on the germination capacity of the seed. A series of experiments recently carried out at the Department's seed-testing station showed that turnip-seed suffered no diminution in germination after soaking for seven days at a temperature of 65° to 70° F. in pure turpentine. As about twelve hours' steeping is the practice usually followed, a good margin of safety is thus indicated. After seven days the vitality of the seed in the test began to be affected, a loss of 5 per cent. to 10 per cent. in germination capacity resulting from steeping for fourteen days.

SPENT OXIDE AS A MANURIAL DRESSING.

Some criticism has been expressed of the following paragraph, published in the *Journal* for November last: "Spent oxide, which can often be had from gasworks for the cartage, is rich in sulphur, and also in nitrogenous compounds which when allowed to oxidize on the surface of pasture are transferred into useful nitrogenous fertilizers. The sulphur is also of value on some soils." It is pointed out that spent oxide is used as a destroyer of vegetation, and that nothing will grow where it has been deposited; further, that when lying in bulk its fumes are deleterious to any adjacent vegetation.

Commenting on this criticism the Department's Chemist states that the position of spent oxide is analogous to that of salt, which in large quantities is an excellent weed-killer for paths, &c., and is often used as such, whereas in small quantities it makes an equally good top-dressing for many grasslands or for mangolds and other plants which crave for salt. The Department has used as much as 5 cwt. per acre of spent oxide on pasture with excellent results, a 5-acre paddock having been top-dressed with it. Outside authorities can also be cited as to the fertilizing-value of this material. Care should be taken, however, not to leave it lying in heaps on ground where any growth is desired, nor to apply it heavily for fertilizing purposes.

THE RELATION OF BIRDS TO AGRICULTURE IN NEW ZEALAND.

VII. THE HERONS AND DUCKS.

J. G. MYERS and ESMOND ATKINSON, Biological Laboratory, Wellington.

THE HERONS.

THE heron family comprises birds of powerful flight and wide-ranging propensities. It is therefore no matter for surprise that even New Zealand, isolated as it is by wide stretches of water, receives irregular and doubtless often accidental visits from at least five species of foreign herons, which are, however, far too rare to concern our present interests. There remain four probably resident species; but even among these, two—namely, the little bittern and the white heron—are too restricted in their range or too few in numbers to enter into economic relations with man. Of the beautiful white heron, or kotuku, one large heronry is still known in New Zealand, and it is said that even from this young birds were actually fed to the pigs; but it is highly satisfactory to learn that of late years rigid protection has been enforced, resulting in a marked increase of this interesting and useful species.

There remain, then, two species only—the blue heron and the bittern—which are sufficiently numerous to be considered here; but before these are described a few notes on the order Herodiones (herons) as a whole will be appropriate. Closely related to our own white heron, which is in fact grouped among them, are the egrets, noted on the one hand for the cruelty attendant on the collection of their beautiful breeding-plumes for ladies' hats, and on the other for their almost unparalleled service to agriculture. In Egypt particularly a monetary estimate of their value as destroyers of cotton pests reaches a figure which would probably not be credited were we to give it.

It has been suggested that one or more species of the smaller egrets, which in parts of Africa are accustomed to feed on the ticks infesting cattle and other animals—perching gracefully on the bodies of their patients for this purpose—should be introduced into New Zealand to combat the now well-known cattle-tick (*Haemaphysalis bispinosa*). Although in the present case the reputation of the egrets is entirely spotless in their own *native countries*, yet the present writers are strongly opposed to "acclimatization" in any form. In the present state of biological knowledge there is not a single beast or bird the behaviour of which *in a new country* can be definitely predicted. If foreign birds or mammals must be introduced they should first receive the same exact scientific study as is given to insect parasites before these are liberated in New Zealand to combat pests. Furthermore, they should be studied under control conditions in this country before liberation—a proviso easy enough in the case of insects, but very

difficult in the case of birds or mammals. Even then the far less restricted and more readily adaptable feeding-habits of birds and beasts would render utterly impossible any such accurate predictions as can be made when dealing with insect parasites, many of which are restricted in their diet to only one kind of pest, in the absence of which they will starve—a limitation which is at once the strength and the weakness of pest-control by parasites. It was a species of perverted patriotism which led wholly unqualified people in the past to introduce into New Zealand a whole host of foreign birds and beasts—a practice which in a considerable proportion of cases has brought serious consequences, often of national extent; it is a higher and nobler and, the writers venture to state, a more profitable patriotism which cherishes and conserves our own native-bird resources.

In the case of the egrets, their introduction as a measure against the cattle-tick is rendered quite unnecessary by the good services of the starling in combating this pest. In most other countries into which the starling has been introduced, notably in America and in Australia, it has been condemned in no measured terms. In New Zealand, whatever be its crimes in the fruitgrowing districts, in North Auckland its destruction of the cattle-tick far overbalances any injurious tendencies.

To return to the herons, the stomach-capacity of the birds of this order may be judged from Leach's remark that in a large flock of straw-necked ibises in Australia "each bird shot contained on the average two thousand young grasshoppers."

The Bittern (Botaurus poiciloptilus Wagler).

The bittern, or matuku-hurepo, of New Zealand is a very near relative of the well-known English species. It is still far from rare, but its numbers will inevitably decrease as the progress of settlement demands the drainage of more and more of the swamps which form its chief refuge. Of shy retiring habits, it is far more often heard than seen, but it is not easily mistaken when once a sight of it has been obtained. Nor is its note likely to be confused with that of any other bird. It is a loud booming, often heard during the day or at night resounding over the swampy flats with a tone like that of a distant motor-car or the bellowing of a far-away bull.

The bird itself is of considerable size, with the long legs and neck of the heron family, and in colour a dark brown with blackish-streaked paler portions, especially on the breast. The long sharp-pointed beak and green legs are very distinct. The greenish-brown eggs are deposited in a well-made, large nest built usually in a swampy situation—often, in fact, in the water itself.

Concerning the feeding-habits of the bittern there are two sides to be considered. Our own bittern occurs also in Australia, and was dealt with by Cleland and his associates in their exhaustive investigation into the food of Australian birds. Although in the single bittern examined the only animal food discovered was "weevils," they unhesitatingly stigmatized this bird as injurious—"from an economic standpoint a pest, destroying many young fish." The experience of the writers in New Zealand will not permit such a

sweeping denunciation. The frequently aquatic nature of its habitat, combined with a peculiar trait in human nature which is strangely apt to suppose that the only food in the water is fish, produce the very general belief that the bittern is predominantly a fish-eater. Even Buller states positively that "it subsists on mice, lizards, eels, and fresh-water fish of various kinds." It is important, especially for the farmer, to realize that this is very far from being altogether the case. In the stomach of a bittern found accidently shot in North Auckland one of the writers counted no fewer than twelve large black crickets (*Gryllus servillei*), two small dragon-flies (*Austrolestes colensonis*), and two full-fed cutworms of *Agrotis ypsilon*, the black or greasy cutworm —a most widespread and destructive species. There is no evidence here against the belief that insects form a considerable portion of its diet. Doubtless, under favourable conditions more fish would be taken than is indicated above; but in low-lying country where trout are not established, or where suitable streams are absent, there can be no question whatever that the bittern, in destroying such major pests as the large black cricket and the black cutworm, deserves high rank as a bird beneficial to agriculture.

The Blue Heron (Demigretta matook Vieill).

The specific name (the second portion of the scientific appellation) is an ugly corruption of the Maori *matuku*. Our New Zealand blue heron, which is so closely related to the common reef-heron (*Demigretta sacra* Gm.) of Australia and Polynesia that many consider it the same, confines its activities almost entirely to the sea-coast, favouring particularly those parts which are sufficiently rocky to supply pools for its hunting and shelter for its nesting. Such a habitat largely debars it from agricultural consideration. It is, however, an entirely harmless species, and it is a matter for congratulation that such a quaint and charming ornament of our shores should now be on the increase. In many districts the blue heron is commonly known as a "crane." It is important to realize that this is entirely a misnomer, the cranes belonging to quite a different order of birds, with dissimilar feeding-habits, economic bearing, and structure, though with a slight superficial resemblance in general appearance to the herons.

THE DUCKS.

Hitherto we have been concerned with birds chiefly as friends or as enemies. In considering the ducks we find birds playing a different role and entering into much more direct and intimate relations with man—namely, as objects of sport and articles of diet. Some orders of birds there are of which few people think in any other terms; among these are the ducks and their allies, the swans and geese. Under proper game laws rigidly enforced an abundance of sporting-birds is an asset to the country; but the delimiting of shooting seasons, the periodic declaration of close seasons, and the differentiations between species which are wholly protected and those which may be shot under certain conditions—all these render the game laws necessarily somewhat complex, and their enforcement, particularly in the backblocks, a matter of extreme difficulty. Yet it is only by such differential treatment that the practical and profitable conservation of

our native-game resources is possible. In other words, there are some of our indigenous ducks which a very little more shooting would probably exterminate, while there are others which may be shot *in season* without any risk of materially decreasing their numbers, provided that at the same time something constructive is done in the matter of keeping breeding reserves unmolested.

In passing to a more detailed consideration of our New Zealand ducks and their allies we shall include among the latter the black swan and deal with it in this article, thus departing to some extent from our usual custom of treating all the introduced birds in the later articles of the series.

Both in number of kinds and abundance of individuals—particularly the latter—New Zealand is by no means poorly supplied with ducks. Including ducks, geese, and swans we have on our list no fewer than twelve indigenous (all ducks) and three introduced species, but of the former only three are sufficiently plentiful to form legitimate game, while of the latter only one, the black swan, is at all generally distributed. But the four species of waterfowl which can afford legitimate sport are sufficiently numerous in individuals and diverse in feeding-habits to warrant the assertion that no material increase in the total duck population can be expected from any further attempts at the introduction and "acclimatization" of foreign kinds. In fact, there is already competition. Thus G. M. Thomson writes: "Sir Walter Buller states, and Mr. Drummond repeats the statement, that wherever the black swan is found the wild duck (*Anas superciliosa*) disappears." The sportsmen and would-be "acclimatizers" should take care lest in reaching for the shadow they for ever forfeit the substance.

It is to the interest of every sportsman conscientiously to discriminate between the different kinds of duck which he shoots. In the absence of a New Zealand traditional knowledge like that which helps the shooter in England, and in view of the close resemblance which often occurs between the female ducks of different species, such discrimination as that recommended above, and *demanded* by law, is by no means easy.

Before leaving the consideration of ducks in general it may be well to point out that, quite apart from their relation to the sportsman, these birds have a role of their own to play in nature fully as important in the scheme of things and in its effect on man's welfare as that of other members of the New Zealand bird fauna. As an instance we may note that ducks, even the domestic kinds, are inveterate enemies of mosquitoes in the larval or aquatic stage. Thus McAtee found that ten domestic ducks introduced into a heavily mosquito-infested fish-pond 1,400 square feet in area cleared it of all pupæ (second stage) in twenty-four hours, and of all but the very smallest larvæ in forty-eight hours. Those ducks which feed on fresh-water snails must bear an important part in the control of the destructive liver-fluke of which these snails are the intermediate host.

Taking the New Zealand list in detail, with special attention to those common species which rank as game, and deleting those which are merely stragglers or confined to outlying islands, we come first to the paradise duck.

The Paradise Duck (Casarca variegata Gm.).

This magnificent bird is too well known to need description. From its frequent presence in parks and on ornamental waters it is perhaps better known abroad than almost any other New Zealand bird. In its native country it is fairly abundant in the South Island and much less so in the North Island, becoming increasingly rare farther north. This last season (1923), in response to complaints that flocks of these birds were damaging crops of various kinds, an open season was declared for a limited area only. Although the feeding-habits of the paradise duck may indubitably lead it into incursions of this kind, it is also certain that the damage committed can never be otherwise than of negligible proportions while the species is no more plentiful than it is at present. If the present reduced numbers can commit serious depredations one wonders why the countless thousands which bred on the South Island river-beds in the early days of colonization did not render cropping impossible.

The Grey Duck (Anas superciliosa Gm.).

This bird, which occurs also in Australia and Malaya, is the duck *par excellence* of New Zealand. It is widespread and abundant wherever suitable conditions prevail. It is probably far less appreciated than it should be. Thus G. M. Thomson writes: "In spite of the fact that the native wild duck of New Zealand (*Anas superciliosa*) is as fine a bird both for sport and table purposes as any species of the family that can be introduced, the various acclimatization societies have for many years made continuous efforts to naturalize other species." Buller states that "it is deservedly in high estimation for the table, and may be regarded as perhaps the most valuable of our indigenous birds."

The similarity of the sexes in size and colour, the greyish-brown plumage marked with yellow-white, the white eyebrow, the green speculum or glossy patch on the wing, and the very considerable size, all serve to render this species easily recognizable.

The choice of a nesting-site varies considerably; the nest may be a considerable distance from water, and even at a height in a tree.

The grey duck is placed on the Third Schedule of the Animals Protection and Game Act, 1921: that is, it is ranked as native game, and may be shot, under license, every season.

The Grey Teal (Virago gibberifrons Müller).

This is a rare species, said, however, to breed in the North Island. Perhaps the smallest of our ducks, it is sometimes known as the "little teal." Unlike the so-called black teal and red or brown teal, the present species is a true teal. The brownish back, spotted underparts, white bar and green speculum on wing, coupled with the small size, will aid identification. It is placed on the First Schedule of the Act, and is therefore absolutely protected.

The Brown Duck (Elasmonetta chlorotis Gray).

The brown duck, often known as the "red teal" or "brown teal," occurs nowhere else in the world, nor has it any close relatives. In

New Zealand, moreover, it is becoming very scarce—so much so that its inclusion in the First Schedule of the Act as an absolutely protected bird came not a whit too soon.

The colour is somewhat variable, but the strong tinge of reddish or rufus, and the greenish-black speculum bordered above and below with rufous-white, serve to distinguish it. Its note is very distinct —a fairly shrill, short whistle, which may be represented by the word "wheet."

The Shoveller (Spatula rhynchotis Latham).

Among sportsmen this beautiful duck often goes by the name of "spoonbill," in allusion to the shape of the bill. The Maori name is kuruwhengi. This "is by no means a common species in any part of New Zealand," says Buller. Unlike the grey duck and the "black teal" or scaup, it does not congregate to any great extent in flocks. The sexes differ considerably, the female being very much plainer than the beautiful-plumaged male, but the remarkable spoon-shaped bill prevents either from being confused with any other duck in New Zealand.

The shoveller is placed on the Third Schedule (native game), and may be shot under the proper restrictions for each district.

The Blue Duck (Hymenolaimus malacorhynchus Gm.).

The blue duck, mountain duck, or whio, is one of New Zealand's own most peculiar and, we hope, most treasured possessions. To quote Buller: "Far up the mountain-gorge, where the foaming torrent, walled in on both sides, rushes impetuously over its shingle-bed, surging around the huge water-worn boulders that obstruct its course, and forming alternately shallow rapids and pools of deep water, there the blue duck is perfectly at home, and its peculiar whistling or sibilant note may be readily distinguished amidst the noise of the rushing waters."

The blue duck, easily recognized by its slate-blue plumage spotted with reddish on the breast, is probably of no appreciable econonic value; but it is an intrinsically beautiful accompaniment of a type of scenery which embodies the very spirit of New Zealand, and the absolute protection accorded to it should therefore be gladly respected by all.

The Scaup (Fuligula novaeseelandiae Gm.).

This sturdily built little species is more frequently known as the "black teal." As, however, it is not related to the true teal, but belongs to a totally different subfamily of ducks, this name should not be used.

"It is freely distributed over the country, frequenting most of the rivers and lagoons, but seldom being met with in the bush-creeks, and never on the open seashore. In winter it associates in large flocks, mingling freely with the grey duck and other species; but at other times it is more generally met with in pairs or in parties of four or five together. Its powers of flight are very feeble; it takes wing with reluctance and never rises high in the air, generally only skimming the surface; but it is a very expert diver, and usually trusts to this

faculty for eluding pursuit" (Buller). Apart from the fact that the scaup does, on occasion, fly at a considerable height, the foregoing description is very fine. We may add that the blackish plumage, coupled with the small size and short wings, render the scaup easily recognizable.

It is placed on the Third Schedule (native game), and may therefore be shot under the proper restrictions for each district.

General.

In concluding this necessarily short and somewhat scrappy account of the ducks of New Zealand we cannot do better than quote the following lucid comparative notes by H. Guthrie-Smith. Writing of the blue duck, the brown duck, the scaup, and the grey duck, he states: "Each of these four kinds of duck has its own peculiar haunts and habits. The blue duck will be found in the deep, cool gorges and rushing bouldered streams, and nowhere else. The brown duck breeds probably near the little blind creeks that percolate rather than flow through the marsh-lands. There during the daytime he quietly rests, or, if on larger sheets of water, lurks until dusk in deep shadow and almost motionless. The scaup seems to breed only on the lake's very edge, during the winter months to congregate in large flocks, to be in deep water during the daytime, and under no circumstances to visit the river-beds. The grey duck's nesting-sites are more diffuse: by lake-edge, river-brim, and far from water, even (not very rarely) on trees, their eggs may be discovered. During the day they often rest on flat shore-lands, or swim close along the raupo edge. No one of these breeds interferes with the other, nor do their resting-places overlap."

THE BLACK SWAN (CYGNUS ATRATUS LATHAM).

No description is needed of this very familiar bird, which has already become so numerous in many portions of New Zealand—almost, in fact, wherever swamps and lagoons of sufficient size afford it food and resting-haunts. In spite of the fact that it finds a place in the Third Schedule of the Animals Protection and Game Act as "native game," it is, of course, not indigenous to New Zealand, but was introduced from Australia. Largely a vegetable feeder, it is enabled by its long neck to obtain food on a bottom which by shorter-necked or smaller birds could be reached only by diving.

INTRODUCED GEESE AND DUCK.

As already mentioned, only three species of the twenty-five ducks, geese, and swans which have at various times been introduced into New Zealand have become even partially acclimatized. The two we have not yet dealt with are the mallard or English wild duck (*Anas boscas*) and the Canada goose (*Branta canadensis*). G. M. Thomson states that the former is now established in the southern portion of the South Island, and to a less definite extent in the Wairarapa district, while the latter is said to be thriving in portions of Otago and Canterbury. Both species are placed in the Second Schedule (imported game), and may therefore be shot under the proper restrictions. This

schedule includes also no fewer than five other species of foreign ducks and four of geese which have not succeeded in establishing themselves.

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TESTING OF PUREBRED DAIRY COWS.

DECEMBER CERTIFICATE-OF-RECORD LIST.

W. M. SINGLETON, Director of the Dairy Division.

Certificates are still being issued in large numbers for purebred dairy cows which have been on C.O.R. test, as the lengthy appended list clearly shows. The list comprises all cows which received certificates during the month of December, 1923.

At the request of some of the breeders' associations co-operating with the Department a new feature has been added to these C.O.R. returns—namely, an indication of the number of times daily each cow was milked. An asterisk (*) attached to a cow's name signifies that the cow was milked three times daily during the whole of her lactation period on test, and a dagger (†) that she was milked three times daily part of the period and twice daily for the remainder. In those cases where the name bears no such mark the cow was milked only twice daily throughout her full milking-period.

MILKING SHORTHORN CLASS-LEADERS.

It is pleasing to be able to congratulate Messrs. Ranstead Bros., Matangi, on the possession of two cows which have exceeded the previous highest yield for their class, both names appearing in the current list. Matangi Nancy 2nd, a junior four-year-old, who produced 608·28 lb. of butterfat, has defeated Matangi Jewel, a herdmate and previous leader of her class, by almost 100 lb. Matangi Ruth 2nd, with a certificate for 747·86 lb. butterfat, becomes the leader of the senior three-year-olds and champion of the Milking Shorthorn

breed in New Zealand. As a class-leader she supersedes Mr. De la Haye's Terrace View Rosy 2nd by 170·86 lb. fat, and as champion of the breed has exceeded the performance of Messrs. Ranstead Bros.' fine old cow Maniaroa Princess by 47·10 lb. fat.

Both Matangi Ruth 2nd and Matangi Nancy 2nd were sired by Dominion Esau of Ruakura, a bull bred by the Department of Agriculture at the Ruakura Farm of Instruction, Hamilton East. This bull is from Dominion Jean of Ruakura, who has a C.O.R. for 532·61 lb. fat in 344 days, at eight to nine years of age. Matangi Nancy 2nd is from Matangi Anne, who has a C.O.R. for 483 lb. fat. Dominion Esau of Ruakura is also the sire of Matangi Quality 4th, with 591 lb. fat, Matangi Cherry 1st, with 360·77 lb., and Matangi Pauline, with 293·84 lb. as a junior two-year-old.

There is therefore adequate evidence that these two outstanding cows are from a family which has proved itself capable of sound production.

LIST OF RECORDS, DECEMBER, 1923.

Name of Cow and Class.	Tested by	Age at Start of Test.	Fat req'd for Cert.	Yield for Season.		
				Days.	Milk.	Fat.
		JERSEYS.				
Junior Two-year-old.		Yrs. dys.	lb.		lb.	lb.
Alfalfa Sweet Heather	F. J. Saxby, Hamilton	1 316	240·5	365	9,655·2	649·57
Alfalfa Daisy ..	F. J. Saxby, Hamilton	1 314	240·5	365	8,578·7	552·21
Alfalfa Fox's Serenade	F. J. Saxby, Hamilton	1 329	240·5	365	9,502·2	533·64
Jersey Park Fancy ..	D. Kennedy, Morven	2 13	241·8	365	9,382·4	533·50
Spec's Girl ..	A. J. Harris, Bombay	1 266	240·5	365	8,945·4	522·35
Rewa Merequest ..	W. H. Booth and Sons, Carterton	2 34	243·9	365	9,097·0	508·81
Glorious Ringlet ..	L. W. and J. T. Prosser, Leeston	2 24	242·9	357	7,453·6	503·72
Richwood Dot ..	R. E. Clements, Awakino Point	1 332	240·5	365	8,465·45	451·54
Worksop Sunshine ..	H. H. Sutton and Co., Longbush ..	1 358	240·5	365	9,464·0	451·29
Sunnibelle ..	J. Nicholson, Manakau	1 314	240·5	365	8,333·8	447·66
Sunny Meadows Ivy	F. J. Wyatt, Towai ..	2 7	241·2	365	6,418·2	442·73
Belvedere Beryl ..	J. A. Pettigrew, Pihama	2 31	243·6	365	6,986·1	439·45
Burnside Gem ..	S. J. Hollard, Rowan	1 313	240·5	365	6,682·25	437·90
Round Bush Fuchsia	F. W. Cornwall, Bell Block	2 25	243·0	365	7,188·6	433·11
Viola's Belle ..	J. Nicholson, Manakau	1 312	240·5	365	7,472·7	430·47
Silverdale Alma ..	G. Hodgson, Whakapara	1 291	240·5	365	7,498·3	430·15
Fernaig Fairy ..	C. Parker, Hairini ..	1 364	240·5	365	6,545·4	424·63
Woodstock's Windflower	Mrs. A. Banks and Son, Kiwitea	1 355	240·5	365	8,596·3	422·71
Rewa Merriflower ..	W. H. Booth and Sons, Carterton	2 9	241·4	365	9,537·3	414·12
Jerseydale Mermaid	J. Pettigrew, Pihama	2 45	245·0	365	6,880·8	411·00
Silverdale Joan ..	G. Hodgson, Whakapara	1 303	240·5	357	6,860·7	398·84
Fury's Enid ..	W. J. Spooner, Awapuni	2 61	246·6	365	7,830·4	398·05
Orange Dale's Briar	W. J. Hall, Matatoki ..	1 339	240·5	344	8,058·5	395·18

LIST OF RECORDS—*continued.*

Name of Cow and Class.	Tested by	Age at Start of Test.	Fat req'd for Cert.	Yield for Season.		
				Days.	Milk.	Fat.
JERSEYS—*continued.*						
Junior Two-year-old—continued.		Yrs. dys.	lb.		lb.	lb.
Poplarvale Bluebell	R. C. Henry, Bell Block	2 3	240·8	365	6,029·6	394·58
Sunny Meadows Bluebell	F. J. Wyatt, Towai	2 31	243·6	365	7,180·8	393·56
Silverdale Bella	G. Hodgson, Whakapara	1 355	240·5	365	8,030·4	387·52
Beechlands Heather	Moreland and Son, Te Rapa	1 335	240·5	313	7,042·1	386·35
Treasure Queen	C. B. Herrold, Waiuku	1 340	240·5	364	6,392·9	376·69
Poplarvale Rosabell	R. C. Henry, Bell Block	1 345	240·5	365	5,777·7	374·52
Sunny Meadows Lily	F. J. Wyatt, Towai	1 322	240·5	365	5,767·0	372·29
Sundial	A. R. Valder, Mangawhare	1 227	240·5	365	6,257·3	366·08
Tawa Berry	J. Nicholson, Manakau	2 27	243·2	304	6,465·6	364·49
Ivondale's Rainbow Lass	P. J. Petersen, Brixton	1 342	240·5	340	6,830·6	358·20
Curlene	J. A. Pettigrew, Pihama	2 41	244·6	365	6,461·9	353·51
Ivondale's Rose Blossom	P. J. Petersen, Brixton	2 49	245·4	340	7,409·3	352·80
Noble Golden Fern	C. Stevens, Maungatapere	1 350	240·5	365	6,754·1	343·67
Wotton Plush	S. R. Lancaster, Palmerston North	2 86	249·1	365	6,003·5	331·97
Brown Leaf	F. E. Day, Tamahere	1 363	240·5	365	5,723·8	330·84
Holly Oak Flash Lady	J. Hale, New Plymouth	1 240	240·5	301	5,885·2	325·54
Vicella	T. Foreman, Alton	2 0	240·5	365	5,973·0	309·92
Ivondale Girl	P. J. Petersen, Brixton	2 61	246·6	308	6,780·5	308·85
Gaytime	F. E. Day, Tamahere	2 38	244·3	365	4,818·1	300·88
Maori Flower	G. L. Lewis, Fendalton	1 272	240·5	305	5,220·1	295·98
Zanita	A. Rogers, Katikati	2 20	242·5	365	5,838·7	291·45
Fawn Princess	F. E. Day, Tamahere	2 20	242·5	316	5,223·4	266·29
Remuera Premier	E. H. Linnell, Midhirst	2 10	241·5	339	4,455·7	259·91
Stylish Briar Flower	F. E. Day, Tamahere	2 7	241·2	358	4,826·9	251·92
Senior Two-year-old.						
Silverdale Stella	G. Hodgson, Whakapara	2 337	274·2	365	10,099·2	583·14
Dianella	J. Nicholson, Manakau	2 346	275·1	365	10,090·3	572·92
Parakau Hopeful	D. A. B. Allison, Pukekohe	2 350	275·5	355	8,945·9	500·26
Jersey Brae's Bonnie	W. H. Miers, Rukuhia	2 341	274·6	365	8,566·8	497·42
Dilemma	J. Nicholson, Manakau	2 175	258·0	364	8,082·8	494·58
Ivondale's Belgium Girl	P. J. Petersen, Brixton	2 364	276·9	326	7,803·0	421·35
Ivondale's Waitress	P. J. Petersen, Brixton	2 328	273·3	322	7,971·6	397·16
Ivondale's Pretty	P. J. Petersen, Brixton	2 314	271·9	331	8,447·3	392·62
White Phlox	F. E. Day, Tamahere	2 360	276·5	352	5,932·8	327·23
Fernaig Freda	S. C. Colmore-Williams, Dargaville	2 130	253·5	311	5,049·7	314·53
Burnside Dusky	S. J. Hollard, Rowan	2 108	251·3	297	5,158·0	300·43
Lady Sweetheart	A. J. Harris, Bombay	2 305	271·0	294	4,927·1	293·38
Ivondale's Cream Carnation	P. J. Petersen, Brixton	2 329	273·4	200	6,166·3	276·95

LIST OF RECORDS—*continued.*

Name of Cow and Class.	Tested by	Age at Start of Test.	Fat req'd for Cert.	Yield for Season.		
				Days.	Milk.	Fat.
		JERSEYS—*continued.*				
Three-year-old.		Yrs. dys.	lb.		lb.	lb.
Oaklands Ruebe ..	F. W. Cornwall, Bell Block	3 349	311·9	365	12,948·3	696·22
Oaklands Guernsey	F. W. Cornwall, Bell Block	3 14	278·4	365	10,565·3	692·54
Grey Gown of Rosy Creek	H. George, Kaupokonui	3 23	279·3	365	11,490·4	607·30
Pet's Top ..	H. J. Burrell, Bunnythorpe	3 56	282·6	365	9,747·6	602·36
Orange Waif ..	H. J. Burrell, Bunnythorpe	3 39	280·9	365	9,425·3	563·80
Richwood Molly ..	C. Parker, Hairini ..	3 354	312·4	365	9,261·5	555·60
Oaklands Lindazelle	F. W. Cornwall, Bell Block	3 60	283·0	365	8,628·7	552·07
Orange Dale's Olga	W. J. Hall, Matatoki	3 11	278·1	365	9,062·5	536·50
Jerseydale Tricksey..	J. Pettigrew, Pihama	3 75	284·5	363	8,599·1	525·15
Beachlands Malvoisie	Moreland and Son, Te Rapa	3 10	278·0	365	11,314·7	518·71
Holly Oaks Lala ..	H. H. Sutton and Co., Longbush	3 74	284·4	364	9,096·5	500·35
Ensley Princess ..	R. F. Wilkinson, Pukekohe	3 360	313·0	365	8,158·1	480·80
Rosendale's Pride ..	R. J. Ballantine, Normanby	3 362	276·7	365	7,625·4	474·38
Statice	J. Nicholson, Manakau	3 355	312·5	365	9,459·5	468·01
Holly Oaks Princess	R. R. Dean, Te Kumi	3 20	279·0	346	9,192·3	467·59
Woodstock's Flirt ..	A. Banks and Son, Kiwitea	3 27	279·7	365	8,493·5	465·77
La Volupta ..	G. A. Gamman, Marton	3 5	277·5	365	9,156·6	456·51
Iscia Mahone ..	C. Stevens, Maungatapere	3 39	280·9	365	7,968·3	447·64
Daystar's Choice ..	C. Meuli, Tariki ..	3 63	283·3	338	7,539·4	437·68
Ivondale's Heather Girl	P. J. Petersen, Brixton	3 339	310·9	302	7,571·0	433·92
Orange Dale's Butter	W. J. Hall, Matatoki	3 5	277·5	344	8,311·1	430·73
Aberbrothock's Aster	W. P. Begg, Arapohue	3 27	279·7	365	7,536·1	428·51
Lassie Wisp ..	W. Muir, Waihi ..	3 251	302·1	296	5,941·9	353·67
Belvedere Lily ..	A. J. Cotton, Wakatu	3 18	278·8	365	5,887·8	332·32
Four-year-old.						
Miro Meadows Rita..	A. A. Ward, Tariki ..	4 11	314·6	365	10,290·8	625·94
Oakland's Primrose..	F. W. Cornwall, Bell Block	4 11	314·6	365	10,650·2	589·79
Jersey Bank Jolly ..	R. C. Jury, Tikorangi	4 4	313·9	365	11,496·1	573·86
Pride	R. E. Clements, Awakino Point	4 80	321·5	365	8,325·9	451·88
His Lordship's Lady	W. H. Waterhouse, Runciman	4 4	313·9	365	8,629·2	387·86
Mature.						
Belmont Novice ..	G. H. Stiles, Palmerston North	6 217	350·0	365	13,576·6	811·26
Hawkesbury Peeress	H. Salway, Bell Block	6 3	350·0	365	12,949·2	712·37
Charming Irene ..	C. Stevens, Maungatapere	7 294	350·0	365	11,956·8	687·51
Oakden Bonnie† ..	J. H. Sherrard, Otaua	7 80	350·0	365	12,524·8	685·19

LIST OF RECORDS—*continued.*

Name of Cow and Class.	Tested by	Age at Start of Test.	Fat req'd for Cert.	Yield for Season.		
				Days.	Milk.	Fat.
			JERSEYS—*continued.*			
Mature—continued.		Yrs. dys.	lb.		lb.	lb.
Molly Mahone ..	C. Stevens, Maungatapere	9 28	350·0	365	11,252·3	665·30
Flox	Moreland and Son, Te Rapa	5 191	350·0	365	9,157·6	645·26
Miro Meadows Maud	A. A. Ward, Tariki ..	7 61	350·0	365	11,551·6	623·62
Duchess of Woodstock	A. Banks and Son, Kiwitea	6 52	350·0	283	10,201·9	575·12
Maori Gem ..	H. B. Lepper, Lepperton	7 9	350·0	352	10,934·6	568·21
Gem's Mamy ..	H. B. Lepper, Lepperton	8 340	350·0	352	10,985·8	556·45
Pink Chase ..	W. J. Hall, Matatoki	6 236	350·0	365	8,914·0	555·87
Blackberry ..	J. Nicholson, Manakau	5 325	350·0	365	9,857·4	546·95
Viola's Golden Girl ..	R. J. Wilson, Putaruru	5 46	350·0	365	8,215·7	529·37
Cynthia	T. H. Verry, Pahiatua	10 236	350·0	365	11,514·6	525·71
Olga's Butterman Chase	W. J. Hall, Matatoki	10 16	350·0	344	8,827·5	522·43
Cynthia of Konini ..	T. H. Verry, Pahiatua	5 300	350·0	350	11,018·3	521·73
Coriopsis	C. Stevens, Maungatapere	7 338	350·0	365	10,343·9	517·14
Lady Nonnie ..	M. V. Reeve-Smith, Aria	5 346	350·0	329	8,982·1	500·95
Fern Grove Louise ..	H. J. Burrell, Bunnythorpe	5 339	350·0	365	8,836·3	477·38
Rewa Amber ..	H. H. Sutton and Co., Longbush	7 325	350·0	333	9,403·0	455·56
Middlewood's Wonder	Moreland and Son, Te Rapa	9 341	350·0	365	9,019·3	449·05
Hillsbourne Belinda	G. A. Gamman, Marton	5 49	350·0	328	7,625·2	447·45
Stromna's Blue Bell	G. Hodgson, Whakapara	7 45	350·0	351	7,745·8	446·20
Aberbrothock's Queen	A. R. Valder, Mangawhare	5 358	350·0	321	7,324·8	429·00
Lilian	H. W. Nicholls, Belgrove	11 73	350·0	326	8,264·3	421·47
Ivondale's Lady ..	P. J. Petersen, Brixton	10 4	350·0	336	7,346·4	417·24
Rioter's Chase ..	W. J. Hall, Matatoki	7 43	350·0	342	8,070·4	414·05
Bright Eyes of Beachlands	C. Parker, Hairini ..	9 4	350·0	276	7,107·2	402·80
Dream's Diadem ..	E. H. Linnell, Midhirst	9 296	350·0	365	7,604·3	351·02
			FRIESIANS.			
Junior Two-year-old.						
Dominion Krugersdorp†	Central Development Farm, Weraroa	1 330	240·5	365	13,653·4	447·56
Pareora Mentor Lass*	A. S. Elworthy, Timaru	2 59	246·4	365	11,989·4	444·92
Domino Colantha Belle*	W. I. Lovelock, Palmerston North	1 322	240·5	365	11,043·2	442·44
Dominion Wild Violet†	Central Development Farm, Weraroa	1 342	240·5	365	12,128·0	439·30
Dominion Sarcastic Lassie	Central Development Farm, Weraroa	2 31	243·6	365	11,594·3	365·04
Everslea Magpie Girl	G. H. Hassall, Clarkville	1 321	240·5	365	10,314·1	326·33

LIST OF RECORDS—*continued.*

Name of Cow and Class.	Tested by	Age at Start of Test.	Fat req'd for Cert.	Yield for Season.		
				Days.	Milk.	Fat.
FRIESIANS—*continued.*						
Junior Two-year-old—continued.		Yrs. dys.	lb.		lb.	lb.
Dutchmaid 4th Gem†	N. P. Nielsen, Tiakitahuna	2 30	243·5	317	9,184·7	302·40
Hanley Betty ..	G. H. Hassall, Clarkville	1 294	240·5	365	9,402·3	298·09
Senior Two-year-old.						
Bloomfield June de Kol*	Bloomfield Farm Co., Wellington	2 195	260·0	323	12,768·6	465·49
Pontiac Blossom of Glen Lynne†	S. Clements, Rototuna	2 200	261·4	330	12,482·7	427·98
Longbeach Transvaal Star*	J. H. Grigg, Longbeach	2 184	258·9	365	12,843·7	402·11
Pareora Aaggie* ..	A. S. Elworthy, Timaru	2 300	271·1	365	13,928·4	390·79
Lady Marquis Snowdrop†	Voss Bros., Longburn	2 340	275·4	365	10,865·6	326·60
Junior Three-year-old.						
Dominion Johanna Woodcrest	Central Development Farm, Weraroa	3 11	278·1	365	14,174·0	441·03
Snowdrop Oak† ..	Voss Bros., Longburn	3 18	278·8	360	11,620·4	409·46
Pearl 2nd† ..	N. P. Nielsen, Tiakitahuna	3 28	279·8	365	12,124·6	402·28
Dominion Lady Piebe	Central Development Farm, Weraroa	3 24	279·4	360	9,864·7	339·48
Senior Three-year-old.						
Hinemoa Beauty* ..	T. R. Eades, Edendale	3 301	307·1	365	23,145·5	812·44
Monavale Felicity Paxton*	R. Marr, East Tamaki	3 325	309·5	365	12,544·1	529·01
Junior Four-year-old.						
Dominion Lady Olga	Central Development Farm, Weraroa	4 19	315·4	351	10,549·9	333·47
Senior Four-year-old.						
Sadie Van Friesland Park†	P. F. Boucher, Kumeu	4 300	343·5	365	12,336·2	468·66
Dominion Jessie Beets†	Central Development Farm, Weraroa	4 277	341·-	287	14,115·9	448·04
Dominion Manola 2nd†	Central Development Farm, Weraroa	4 245	338·0	318	13,682·8	435·24
Mature.						
Burkeyje Sylvia Posch*	North and Sons, Omimi	10 187	350·0	365	22,974·4	710·87
Maud Fayne Johanna 2nd†	Voss Bros., Longburn	6 189	350·0	365	17,195·0	635·84
Monavale Creamelle Regina†	S. Clements, Rototuna	7 62	350·0	318	15,457·9	606·13
Dirk Belle de Kol* ..	E. F. Peacocke, Hamilton	7 321	350·0	365	16,316·3	592·21
Hengerveld Belle Segis†	P. F. Boucher, Kumeu	7 358	350·0	365	16,426·6	561·64
Rosevale Ruby* ..	North and Sons, Omimi	5 359	350·0	365	16,171·4	525·48
Lily de Kol† ..	S. Andrew, Kaikoura	5 318	350·0	365	16,715·4	510·36
Glenlassie de Kol of Te Ngutu†	S. Clements, Rototuna	6 247	350·0	336	17,092·0	486·95

LIST OF RECORDS—*continued.*

Name of Cow and Class.	Tested by	Age at Start of Test.	Fat req'd for Cert.	Yield for Season.		
				Days.	Milk.	Fat.
		FRIESIANS—*continued.*				
Mature—continued.		Yrs. dys.	lb.		lb.	lb.
Riverdale Fancy† ..	E. F. Peacocke, Hamilton	7 308	350·0	364	16,768·7	485·95
Dutchmaid 4th† ..	N. P. Nielsen, Tiakitahuna	7 33	350·0	342	12,756·2	401·56
		MILKING SHORTHORNS.				
Junior Two-year-old.						
Cloverlea Fillpail 2nd	D. Buick, Palmerston North	2 29	243·4	320	9,237·6	347·31
Senior Three-year-old.						
Matangi Ruth 2nd*	Ranstead Bros., Matangi	3 304	307·4	365	14,032·7	747·86
Junior Four-year-old.						
Matangi Nancy 2nd*	Ranstead Bros., Matangi	4 3	313·8	365	15,591·6	608·28
Mature.						
Studleigh Nancy Lee	D. Buick, Palmerston North	8 302	350·0	295	13,074·8	471·48
Studleigh Dairymaid	D. Buick, Palmerston North	..	350·0	274	11,029·1	414·43
Miss Massey A. ..	J. M. Whitham, Glenbrook	5 1	350·0	324	10,479·3	396·36
Pukerima Esta ..	John Fisher, Pukerimu	11 32	350·0	334	8,302·5	369·80
		AYRSHIRES.				
Three-year-old.						
Dolores 2nd of Waipapa	Fred. Mills, Waipapa	3 358	312·8	365	11,755·8	497·80
Four-year-old.						
Dominion Parkhead Girl	Moumahaki Experimental Farm	4 353	348·8	365	10,985·2	423·00
Mature.						
Miss Gillies 1st of Inglewood* ..	R. S. Weir, Seaward Downs	..	350·0	335	13,171·0	541·63
Betty of Waipapa ..	Fred. Mills, Waipapa	9 218	350·0	365	13,260·7	532·33
Daisy of Greenbank*	W. Moore, Homebush	..	350·0	321	10,696·4	479·09
Gladys 2nd of Waipapa	Fred. Mills, Waipapa	9 173	350·0	365	11,610·2	414·74
		RED POLLS.				
Two-year-old.						
Table Top ..	Central Development Farm, Weraroa	1 358	240·5	360	8,306·0	357·14
Dominion Suvla Bay	Central Development Farm, Weraroa	2 47	245·2	356	6,856·3	290·76
Three-year-old.						
Dominion Golden Flower	Central Development Farm, Weraroa	3 65	283·5	300	7,993·8	322·99
Mature.						
Sylph	Central Development Farm, Weraroa	8 45	350·0	335	11,252·2	468·40

LIST OF RECORDS—*continued.*

Name of Cow and Class.	Tested by	Age at starting Test.	Fat req'd for Cert.	Yield for Season.		
				Days.	Milk.	Fat.

Second-class Certificates.

JERSEYS.

		Yrs. dys.	lb.		lb.	lb.
Junior Two-year-old.						
Bilberry's Golden Melody	W. J. Spooner, Awapuni	2 25	243·0	365	8,592·5	503·27
Silverdale Kildare ..	J. Doel, jun., Taumarere	1 339	240·5	365	8,553·5	457·97
Silverdale Golden Hope	G. Hodgson, Whakapara	1 284	240·5	354	5,977·9	370·03
Ensley Jewel ..	R. F. Wilkinson, Pukekohe	1 363	240·5	365	7,704·5	364·72
Fernaig Fruition ..	G. Welsby, Maungatapere	1 352	240·5	320	5,255·5	303.45
Senior Two-year-old.						
Holly Oaks Favourite	M.V. Reeve-Smith, Aria	2 132	253·7	352	8,162·7	429·73
Holly Oaks Bonny ..	S. C. Colmore-Williams, Dargaville	2 209	261·4	353	6,549·3	374·03
Three-year-old.						
Laurel's Heroine ..	H. H. Sutton and Co., Longbush	3 336	310·6	365	9,740·6	490·35
Mature.						
Aparima	C. Stevens, Maungatapere	6 318	350·0	365	10,289·6	574·20

BELLE OF FRIESLAND (C. H. STEADMAN, KAMO).

C.O.R., Friesian mature class: 21,519·4 lb. milk, 822·67 lb. butterfat, in 365 days.

A READY-RECKONER FOR WEIGHT OF FIELD CROPS PER ACRE.

(*Continued from December.*)

TABLE SHOWING WEIGHT OF CROP PER ACRE WHEN THE AREA FROM WHICH THE PRODUCE IS TAKEN IS 1 CHAIN IN 21 IN. DRILLS—EQUIVALENT TO $\frac{1}{377}$ ACRE.

Weight per Area.	Weight per Acre.				Weight per Area.	Weight per Acre.				Weight per Area.	Weight per Acre.				Weight per Area.	Weight per Acre.			
lb.	Tons	cwt.	qr.	lb.	lb.	Tons	cwt.	qr.	lb.	lb.	Tons	cwt.	qr.	lb.	lb.	Tons	cwt.	qr.	lb.
1	0	3	1	13	61	10	5	1	15	121	20	7	1	17	181	30	9	1	19
2	0	6	2	26	62	10	8	3	0	122	20	10	3	2	182	30	12	3	4
3	0	10	0	11	63	10	12	0	13	123	20	14	0	15	183	30	16	0	17
4	0	13	1	24	64	10	15	1	26	124	20	17	2	0	184	30	19	2	2
5	0	16	3	10	65	10	18	3	12	125	21	0	3	14	185	31	2	3	16
6	1	0	0	23	66	11	2	0	25	126	21	4	0	27	186	31	6	1	1
7	1	3	2	8	67	11	5	2	10	127	21	7	2	12	187	31	9	2	14
8	1	6	3	21	68	11	8	3	23	128	21	10	3	25	188	31	12	3	27
9	1	10	1	6	69	11	12	1	8	129	21	14	1	10	189	31	16	1	12
10	1	13	2	20	70	11	15	2	21	130	21	17	2	23	190	31	19	2	25
11	1	17	0	4	71	11	19	0	6	131	22	1	0	8	191	32	3	0	10
12	2	0	1	17	72	12	2	1	19	132	22	4	1	21	192	32	6	1	23
13	2	3	3	2	73	12	5	3	4	133	22	7	3	6	193	32	9	3	8
14	2	7	0	15	74	12	9	0	17	134	22	11	0	19	194	32	13	0	21
15	2	10	2	1	75	12	12	2	3	135	22	14	2	5	195	32	16	2	7
16	2	13	3	14	76	12	15	3	16	136	22	17	3	18	196	32	19	3	20
17	2	17	0	27	77	12	19	1	1	137	23	1	1	3	197	33	3	1	5
18	3	0	2	12	78	13	2	2	14	138	23	4	2	16	198	33	6	2	18
19	3	3	3	25	79	13	5	3	27	139	23	8	0	1	199	33	10	0	3
20	3	7	1	10	80	13	9	1	12	140	23	11	1	14	200	33	13	1	16
21	3	10	2	23	81	13	12	2	25	141	23	14	2	27	201	33	16	3	1
22	3	14	0	8	82	13	16	0	10	142	23	18	0	12	202	34	0	0	14
23	3	17	1	21	83	13	19	1	23	143	24	1	1	25	203	34	3	1	27
24	4	0	3	6	84	14	2	3	8	144	24	4	3	10	204	34	6	3	12
25	4	4	0	20	85	14	6	0	22	145	24	8	0	24	205	34	10	0	26
26	4	7	2	5	86	14	9	2	7	146	24	11	2	9	206	34	13	2	11
27	4	10	3	18	87	14	12	3	20	147	24	14	3	22	207	34	16	3	24
28	4	14	1	3	88	14	16	1	5	148	24	18	1	7	208	35	0	1	9
29	4	17	2	16	89	14	19	2	18	149	25	1	2	20	209	35	3	2	22
30	5	1	0	1	90	15	3	0	3	150	25	5	0	5	210	35	7	0	7
31	5	4	1	14	91	15	6	1	16	151	25	8	1	18	211	35	10	1	20
32	5	7	2	27	92	15	9	3	1	152	25	11	3	3	212	35	13	3	5
33	5	11	0	12	93	15	13	0	14	153	25	15	0	16	213	35	17	0	18
34	5	14	1	25	94	15	16	1	27	154	25	18	2	1	214	36	0	2	3
35	5	17	3	11	95	15	19	3	13	155	26	1	3	15	215	36	3	3	17
36	6	1	0	24	96	16	3	0	26	156	26	5	1	0	216	36	7	1	2
37	6	4	2	9	97	16	6	2	11	157	26	8	2	13	217	36	10	2	15
38	6	7	3	22	98	16	9	3	24	158	26	11	3	26	218	36	14	0	0
39	6	11	1	7	99	16	13	1	9	159	26	15	1	11	219	36	17	1	13
40	6	14	2	20	100	16	16	2	22	160	26	18	2	24	220	37	0	2	26
41	6	18	0	5	101	17	0	0	7	161	27	2	0	9	221	37	4	0	11
42	7	1	1	18	102	17	3	1	20	162	27	5	1	22	222	37	7	1	24
43	7	4	3	3	103	17	6	3	5	163	27	8	3	7	223	37	10	3	9
44	7	8	0	16	104	17	10	0	18	164	27	12	0	20	224	37	14	0	22
45	7	11	2	2	105	17	13	2	4	165	27	15	2	6	225	37	17	2	8
46	7	14	3	15	106	17	16	3	17	166	27	18	3	19	226	38	0	3	21
47	7	18	1	0	107	18	0	1	2	167	28	2	1	4	227	38	4	1	6
48	8	1	2	13	108	18	3	2	15	168	28	5	2	17	228	38	7	2	19
49	8	4	3	26	109	18	7	0	0	169	28	9	0	2	229	38	11	0	4
50	8	8	1	11	110	18	10	1	13	170	28	12	1	15	230	38	14	1	17
51	8	11	2	24	111	18	13	2	26	171	28	15	3	0	231	38	17	3	2
52	8	15	0	9	112	18	17	0	11	172	28	19	0	13	232	39	1	0	15
53	8	18	1	22	113	19	0	1	24	173	29	2	1	26	233	39	4	2	0
54	9	1	3	7	114	19	3	3	9	174	29	5	3	11	234	39	7	3	13
55	9	5	0	21	115	19	7	0	23	175	29	9	0	25	235	39	11	0	27
56	9	8	2	6	116	19	10	2	8	176	29	12	2	10	236	39	14	2	12
57	9	11	3	19	117	19	13	3	21	177	29	15	3	23	237	39	17	3	25
58	9	15	1	4	118	19	17	1	6	178	29	19	1	8	238	40	1	1	10
59	9	18	2	17	119	20	0	2	19	179	30	2	2	21	239	40	4	2	23
60	10	2	0	2	120	20	4	0	4	180	30	6	0	6	240	40	8	0	8

TABLE SHOWING WEIGHT OF CROP PER ACRE—*continued.*

Weight per Area.	Weight per Acre.	Weight per Area.	Weight per Acre.	Weight per Area.	Weight per Acre.	Weight per Area.	Weight per Acre.
lb.	Tons cwt. qr. lb.	lb.	Tons cwt. qr. lb.	lb.	Tons cwt. qr. lb.	lb.	Tons cwt. qr. lb.
241	40 11 1 21	319	53 14 0 7	397	66 16 2 21	475	79 19 1 7
242	40 14 3 6	320	53 17 1 20	398	67 0 0 6	476	80 2 2 20
243	40 18 0 19	321	54 0 3 5	399	67 3 1 19	477	80 6 0 5
244	41 1 2 4	322	54 4 0 18	400	67 6 3 4	478	80 9 1 18
245	41 4 3 18	323	54 7 2 3	401	67 10 0 17	479	80 12 3 3
246	41 8 1 3	324	54 10 3 16	402	67 13 2 2	480	80 16 0 16
247	41 11 2 16	325	54 14 1 2	403	67 16 3 15	481	80 19 2 1
248	41 15 0 1	326	54 17 1 15	404	68 0 1 0	482	81 2 3 14
249	41 18 1 14	327	55 1 0 0	405	68 3 2 14	483	81 6 0 27
250	42 1 2 27	328	55 4 1 13	406	68 6 3 27	484	81 9 2 12
251	42 5 0 12	329	55 7 2 26	407	68 10 1 12	485	81 12 3 26
252	42 8 1 25	330	55 11 0 11	408	68 13 2 25	486	81 16 1 11
253	42 11 3 10	331	55 14 1 24	409	68 17 0 10	487	81 19 2 24
254	42 15 0 23	332	55 17 3 9	410	69 0 1 23	488	82 3 0 9
255	42 18 2 9	333	56 1 0 22	411	69 3 3 8	489	82 6 1 22
256	43 1 3 22	334	56 4 2 7	412	69 7 0 21	490	82 9 3 7
257	43 5 1 7	335	56 7 3 21	413	69 10 2 6	491	82 13 0 20
258	43 8 2 20	336	56 11 1 6	414	69 13 3 19	492	82 16 2 5
259	43 12 0 5	337	56 14 2 19	415	69 17 1 5	493	82 19 3 18
260	43 15 1 18	338	56 18 0 4	416	70 0 2 18	494	83 3 1 3
261	43 18 3 3	339	57 1 1 17	417	70 4 0 3	495	83 6 2 17
262	44 2 0 16	340	57 4 3 2	418	70 7 1 16	496	83 10 0 2
263	44 5 2 1	341	57 8 0 15	419	70 10 3 1	497	83 13 1 15
264	44 8 3 14	342	57 11 2 0	420	70 14 0 14	498	83 16 3 0
265	44 12 1 0	343	57 14 3 13	421	70 17 1 27	499	84 0 0 13
266	44 15 2 13	344	57 18 0 26	422	71 0 3 12	500	84 3 1 26
267	44 18 3 26	345	58 1 2 6	423	71 4 0 25	501	84 6 3 11
268	45 2 1 11	346	58 4 3 25	424	71 7 2 10	502	84 10 0 24
269	45 5 2 24	347	58 8 1 10	425	71 10 3 24	503	84 13 2 9
270	45 9 0 9	348	58 11 2 23	426	71 14 1 9	504	84 16 3 22
271	45 12 1 22	349	58 15 0 8	427	71 17 2 22	505	85 0 1 8
272	45 15 3 7	350	58 18 1 21	428	72 1 0 7	506	85 3 2 21
273	45 19 0 20	351	59 1 3 6	429	72 4 1 20	507	85 7 0 6
274	46 2 2 5	352	59 5 0 19	430	72 7 3 5	508	85 10 1 19
275	46 5 3 19	353	59 8 2 4	431	72 11 0 18	509	85 13 3 4
276	46 9 1 4	354	59 11 3 17	432	72 14 2 3	510	85 17 0 17
277	46 12 2 17	355	59 15 1 3	433	72 17 3 16	511	86 0 2 2
278	46 16 0 2	356	59 18 2 16	434	73 1 1 1	512	86 3 3 15
279	46 19 1 15	357	60 2 0 1	435	73 4 2 15	513	86 7 1 0
280	47 2 3 0	358	60 5 1 14	436	73 8 0 0	514	86 10 2 13
281	47 6 0 13	359	60 8 2 27	437	73 11 1 13	515	86 13 3 27
282	47 9 1 26	360	60 12 0 12	438	73 14 2 26	516	86 17 1 12
283	47 12 3 11	361	60 15 1 25	439	73 18 0 11	517	87 0 2 25
284	47 16 0 24	362	60 18 3 10	440	74 1 1 24	518	87 4 0 10
285	47 19 2 10	363	61 2 0 23	441	74 4 3 9	519	87 7 1 23
286	48 2 3 23	364	61 5 2 8	442	74 8 0 22	520	87 10 3 8
287	48 6 1 8	365	61 8 3 22	443	74 11 2 7	521	87 14 0 21
288	48 9 2 21	366	61 12 1 7	444	74 14 3 20	522	87 17 2 6
289	48 13 0 6	367	61 15 2 20	445	74 18 1 6	523	88 0 3 19
290	48 16 1 19	368	61 19 0 5	446	75 1 2 19	524	88 4 1 4
291	48 19 3 4	369	62 2 1 18	447	75 5 0 4	525	88 7 2 18
292	49 3 0 17	370	62 5 3 3	448	75 8 1 17	526	88 11 0 3
293	49 6 2 2	371	62 9 0 16	449	75 11 3 2	527	88 14 1 16
294	49 9 3 15	372	62 12 2 1	450	75 15 0 15	528	88 17 3 1
295	49 13 1 1	373	62 15 3 14	451	75 18 2 0	529	89 1 0 14
296	49 16 2 14	374	62 19 0 27	452	76 1 3 13	530	89 4 1 27
297	49 19 3 27	375	63 2 2 13	453	76 5 0 26	531	89 7 3 12
298	50 3 1 12	376	63 5 3 26	454	76 8 2 11	532	89 11 0 25
299	50 6 2 25	377	63 9 1 11	455	76 11 3 25	533	89 14 2 10
300	50 10 0 10	378	63 12 2 24	456	76 15 1 10	534	89 17 3 23
301	50 13 1 23	379	63 16 0 9	457	76 18 2 23	535	90 1 1 9
302	50 16 3 8	380	63 19 1 22	458	77 2 0 8	536	90 4 2 22
303	51 0 0 21	381	64 2 3 7	459	77 5 1 21	537	90 8 0 7
304	51 3 2 6	382	64 6 0 20	460	77 8 3 6	538	90 11 1 20
305	51 6 3 20	383	64 9 2 5	461	77 12 0 19	539	90 14 3 5
306	51 10 1 5	384	64 12 3 18	462	77 15 2 4	540	90 18 0 18
307	51 13 2 18	385	64 16 1 4	463	77 18 3 17	541	91 1 2 3
308	51 17 0 3	386	64 19 2 17	464	78 2 1 2	542	91 4 3 16
309	52 0 1 16	387	65 3 0 2	465	78 5 2 16	543	91 8 1 1
310	52 3 3 1	388	65 6 1 15	466	78 9 0 1	544	91 11 2 14
311	52 7 0 14	389	65 9 3 0	467	78 12 1 14	545	91 15 0 0
312	52 10 1 27	390	65 13 0 13	468	78 15 2 27	546	91 18 1 13
313	52 13 3 12	391	65 16 1 26	469	78 19 0 12	547	92 1 2 26
314	52 17 0 25	392	65 19 3 11	470	79 2 1 25	548	92 5 0 11
315	53 0 2 11	393	66 3 0 24	471	79 5 3 10	549	92 8 1 24
316	53 3 3 24	394	66 6 2 9	472	79 9 0 23	550	92 11 3 9
317	53 7 1 9	395	66 9 3 23	473	79 12 2 8	551	92 15 0 22
318	53 10 2 22	396	66 13 1 8	474	79 15 3 21	552	92 18 2 7

TABLE SHOWING WEIGHT OF CROP PER ACRE—*continued.*

Weight per Area.	Weight per Acre.				Weight per Area.	Weight per Acre.				Weight per Area.	Weight per Acre.				Weight per Area.	Weight per Acre.			
lb.	Tons	cwt.	qr.	lb.	lb.	Tons	cwt.	qr.	lb.	lb.	Tons	cwt.	qr.	lb.	lb.	Tons	cwt.	qr.	lb.
553	93	1	3	20	565	95	2	1	10	577	97	2	2	27	589	99	3	0	16
554	93	5	1	5	566	95	5	2	23	578	97	6	0	12	590	99	6	2	1
555	93	8	2	19	567	95	9	0	8	579	97	9	1	25	591	99	9	3	14
556	93	12	0	4	568	95	12	1	21	580	97	12	3	10	592	99	13	0	27
557	93	15	1	17	569	95	15	3	6	581	97	16	0	23	593	99	16	2	12
558	93	18	3	2	570	95	19	0	19	582	97	19	2	8	594	99	19	3	25
559	94	2	0	15	571	96	2	2	4	583	98	2	3	21	595	100	3	1	11
560	94	5	2	0	572	96	5	3	17	584	98	6	1	6	596	100	6	2	24
561	94	8	3	13	573	96	9	1	2	585	98	9	2	20	597	100	10	0	9
562	94	12	0	26	574	96	12	2	15	586	98	13	0	5	598	100	13	1	22
563	94	15	2	11	575	96	16	0	1	587	98	16	1	18	599	100	16	3	7
564	94	18	3	24	576	96	19	1	14	588	98	19	3	3	600	101	0	0	20

GREEN-MANURING TRIAL IN CANTERBURY.

MEANS of maintaining the organic matter in soils in Canterbury presents a constant problem to the farmer. The ploughing-in of crops specially grown for green-manuring purposes is an expensive method, and the results so far observed do not appear to have been generally remunerative. The crop rotations usually followed in the district provide for certain crops such as oats, rape, turnips, and short-rotation pastures being fed off, and thus the organic matter is to a degree maintained.

In order to ascertain if American sweet clover (*Melilotus alba*) would be of value for green-manuring purposes, a trial was arranged last season on the farm of Messrs. Collett Bros., Lyndhurst. Wheat was sown on somewhat light land in the autumn, and in the spring, when the wheat was being harrowed and rolled, adjoining strips were sown with 8 lb. of sweet clover and 4 lb. cow-grass per acre. The spring was dry and summer wet. In each plot a satisfactory germination took place. The wheat was harvested about the middle of January, and by the early autumn the cow-grass area showed a considerable amount of growth, while the sweet clover was thin and weak. During the winter and early spring the cow-grass provided an abundance of feed for sheep, but the sweet clover failed completely.

Apart from the amount of green manure available for ploughing-in in the spring, the autumn and winter grazing more than paid for the seeding in the case of the cow-grass. It must be noted, however, that without the high summer rainfall of 1922–23 the result might have been quite unsatisfactory in both cases.

—*F. E. Ward, Instructor in Agriculture, Christchurch.*

Control of Export of Apples to South American Markets.—By Order in Council gazetted on 20th December the exportation of fresh apples from New Zealand to Argentina, Brazil, and Uruguay is prohibited, except with the consent of the Minister of Agriculture.

SEASONAL NOTES.

THE FARM.

AUTUMN GRASSING.

As autumn approaches, preparation for required grassing must be taken in hand. Considering the results that are expected of a pasture, and the fact that in many cases, such as newly felled bush country, it will be impracticable to rectify mistakes subsequently, it is false economy to stint time, thought, or money in either the preparation of the land or the selection of a seed-mixture.

As regards the second point, too much emphasis cannot be laid on the fact that only those species should be sown that can be reasonably expected to succeed and form a turf sufficiently strong to keep out undesirable growths. To attain this end it is a sound plan to take each separate piece of land on its merits, rather than attempt to make a general mixture cover all requirements. On dry high-lying faces and knolls where the conditions are unfavourable to the better grasses danthonia, brown-top, Chewings fescue, and crested dogstail should be relied upon; Yorkshire fog and Lotus major should be included in mixtures for badly drained swamps or waterlogged land; rye-grass, timothy, and alsike suit the better classes of swamp and all good moisture-holding soils; cocksfoot and white clover do well on all bush-burns of fair quality; while paspalum should be used on areas in the North where dry, hot summers are experienced.

On arable land, as a general principle, it is not good practice to sow down to pasture after a grain crop, owing to the danger of grass-grub and the fact that the soil has been reduced in fertility. Pastures, particularly permanent pastures, should follow a fed-off crop like rape, turnips, or peas. It is recognized, however, that there are times on most farms when sowing to pasture after a grain crop cannot be avoided. In such cases the land should be ploughed as quickly as conditions will permit, and allowed to lie up to the weather, with the object of destroying weeds and giving the land the benefit of the sun. If there is sufficient moisture, sowing may take place about the end of February, but usually March will be early enough.

As regards actual sowing, this should be done as far as possible while rain is pending, more especially where surface-sowing is practised and the seed is left uncovered. On cultivated ground a hollow lumpy tilth is to be avoided at all costs, and rolling is generally advisable.

GREEN FEED.

Where it is intended to utilize the land for crops next spring it should be worked up ready for sowing down in a green crop as soon as weather conditions are favourable. This season, owing to the dry conditions that have prevailed, green feed will be in great demand,

but it is of no use sowing until there is sufficient moisture to ensure a good growth. For autumn feed nothing will come up to Black Skinless barley as regards quickness and quantity of feed, sown at the rate of 2½ bushels per acre with 1 cwt. of super. If sowing oats, and quick feed is desired, Gartons or a similar white oat should be used. If, on the other hand, the feeding is not required until winter or early spring, Algerians are best, sown at from 2½ to 3½ bushels per acre with 1 cwt. super.

Another very useful catch-crop is rye-grass (either Italian or Western Wolths), sown at the rate of 20 lb. per acre, together with a few pounds of red (or crimson) clover and a bushel of Algerian oats. This will give both autumn and early spring feed, and possibly a cut of hay as well; but care should be taken not to use for this purpose any land that lies wet during the winter. Sown pure in February, Western Wolths will provide good green feed and a crop of seed in the following summer. A mixture of 1½ bushels of winter vetches and 1½ bushels of Garton oats is a suitable forage crop for early spring feed under Southern conditions.

Where the land is light and poor in humus, and the field can be spared, it may be sown down in white mustard at 10 lb. to 12 lb. per acre, to be turned under in about two months for green manure.

LUCERNE.

February is a good month for destroying grass and weeds on established areas, provided the land is soft enough to permit cultivation. If very hard it is best left alone until sufficient rain has fallen to soften the top three or four inches of soil. Young first-year crops should be ready for cutting this month. Cut just at the flowering stage, and give the land a stroke or two of the tine harrows or a light cultivation to destroy surface weeds and keep the soil free.

Lucerne should not be sown later than the end of February in Canterbury, owing to the danger from early frosts.

SUNDRY HINTS.

Where land has been fallowed all summer for the destruction of twitch it will be necessary during February to keep the team busy, taking advantage of the sunshine during that month, as in March the land should be deep-ploughed in readiness for autumn sowings. If the land is comparatively clean it can be used for the green-feed crop.

Land intended for autumn wheat should now be skim-ploughed as soon as possible, whether it be out of lea, rape, or stubble.

Intercultivation of turnips and other root crops should still be carried on where possible, as this operation conserves moisture and allows of the aeration of the soil.

Where wheat or other grain crops have been stacked the stuff should be left for at least six weeks, so as to let the grain regain its firmness after the usual sweat in the stack. It is sound economy to thatch —or at any rate cap—all stacks directly harvesting is over, otherwise there is always considerable risk of damage, however well the stacks are built. After harvest or haymaking, mowers and binders should be

carefully cleaned of dirt and grass-seed before being oiled and put away for next season.

In the making of stack ensilage a sheltered position should be chosen if possible for the stack, as difficulty is often experienced in attaining the necessary temperature in exposed situations during windy weather.

Water has been very short on many farms where no proper provision is made, and stock in a great many cases have felt the shortage of water more than the shortage of feed. On such farms all springs should be carefully watched and the water-flow measured during the present dry season for guidance in providing a proper water-supply in future. For dairy herds a good water-supply easily accessible is almost as important as good feed.

—*Fields Division.*

THE ORCHARD.

HARVESTING STONE AND PIP FRUITS.

THE harvesting of stone and pip fruits will now require constant attention. The work should be kept well in hand by going over the trees from time to time and picking all fruits which are ready. Grade at picking-time for maturity, but with due consideration for the market distance. With a large area to go over, particularly with a light crop or trees of low productivity, one is tempted to take the most opportune time and clear the trees at one operation, and grade for maturity later. This has one advantage—the crop is handled quickly; but, on the other hand, there are many disadvantages. Some fruits will have attained advanced maturity, while others are very immature; the labour of the whole harvest is rushed for a period; fruit which should be marketed immediately is held up unduly between the operations of picking and packing; and the marketable output is reduced considerably, due to the quantity of undeveloped fruit which has to be discarded.

It is a most difficult matter to describe in words the correct stage at which to pick fruit, so much depends on the purpose for which the fruit is required. Tree maturity is always a stage ahead of store maturity for quality; therefore to obtain the best quality of fruit required for marketing immediately after picking, such fruit may be allowed to remain on the tree to a much more matured condition than would be the case for fruit required for storing for later markets. There is a point in the maturity of fruit below which picked fruit will wilt and shrivel, or above which picked fruit will mature gradually according to the storage.

Extensive experiments have been conducted to try and determine as near as possible what condition indicates this point, so that the full storage life may be used to advantage. The ground-colour has so far been found the best guide, though not in all instances reliable, as ground-colour characteristics differ according to district quite as much as blush colour. It may be taken as a principle that no fruit

is ready for picking unless its leaf-green ground-colour has taken on a yellowish tinge; by this time the blush colour also is usually well pronounced and changing from dullness to a bright attractiveness.

When picked all fruit should be removed as soon as possible to a cool place or well shaded from the sun. Once off the tree the fruit-pulp rapidly takes on the atmospheric temperature. At picking-time this is usually many degrees above tree-fruit temperature, and exposure results in rapid expansion of the fruit-cells and sweating. Any such rise in flesh temperature will restrict the keeping-period very materially, and is a primary cause of many storage defects.

CODLIN-MOTH.

This is the season of the year when the second brood of codlin-moth can be expected. Most orchardists are well acquainted with the so-called "moth-stings" found at picking-time. These are really the result of the moth-grub having eaten a portion of the skin and tissue before the arsenate has taken sufficient effect to kill it. The spring brood of codlin-grubs feed for a while on the minute hairs covering the fruit, and this affords a good opportunity to kill them before they have damaged the fruit-surface. Now that the fruit has outgrown the downy stage, grubs attack the skin immediately they commence to feed.

In order to ensure an immediate kill, the deposit of arsenate should be kept as fresh as possible. Twenty-one-day intervals are usually regarded as sufficiently often to make the applications, yet the emergence of summer grubs is so irregular and the risk of blemish from their attack so great that the January sprays, at any rate, may with advantage be applied at fourteen-day intervals. Stronger arsenate is sometimes recommended, but experiments indicate that this is not nearly so important as maintaining the usual strength of arsenate in fresh condition. It is not unusual to experience heavy falls of rain during January, and moth-stings are usually more abundant in a crop following such rain, indicating that the spray is nullified to a great extent when washed by rain.

LEAF-ROLLER CATERPILLAR.

These constant applications of arsenate of lead at 1½ lb. per 100 gallons will also assist towards eradicating leaf-roller caterpillar. A very necessary factor in the spraying for leaf-roller is high pressure. At this season many orchardists adjust the nozzles of the rod or gun to produce a very fine mist-like spray, on the assumption that a light deposit is all that is necessary. The habits of leaf-roller are such that this reduced volume of spray is of low value in control, as it does not penetrate the rolled-up leaf or separate the leaf adherent to the fruit; consequently there is no arsenate deposited on the immediate surroundings of the grub. If leaf-roller is present on the trees a much better spray job can be done with a good pressure and a rather coarse nozzle.

APPLE LEAF-HOPPER.

A summer brood of apple leaf-hopper may be expected. Whenever a spray is due, examine the under-sides of the foliage for the nymphs

of this pest. These will be found as a light-green to yellow insect settled along the midrib of the leaf. They later develop into winged insects. In the early stages they are easy to kill. Black Leaf 40, 1–800, gives very satisfactory results; but if remedial measures are not taken promptly, and the insect develops into the winged state, eradication is almost impossible. The damage done by these insects is considerable. The withdrawal of quantities of sap from the tree restricts fruit-development, and the devitalization is such that it is almost impossible to build up mature wood and buds for next season. Trees not in crop must therefore be protected for future years. The excrement of the hopper causes disfigurement of the fruit and collects dirt on the sticky surface.

OTHER SEASONABLE WORK.

Other seasonable orchard-work will include cultivation, sowing of cover-crops, budding, and continuation of spraying as outlined in the December *Journal*.

—*W. H. Rice, Orchard Instructor, Hastings.*

CITRUS-CULTURE.

The maintenance of efficient cultivation and the application also of bordeaux mixture for the control of fungous diseases will be the main work during the coming month. The further spray of bordeaux, 4–4–40, should now be given. Where efficiently applied this compound not only controls verrucosis, but will to a great extent assist in the control of brown-rot, which is so often in evidence among citrus groves at this period of the year.

FIREBLIGHT.

Fortunately, fireblight is less pronounced this season than formerly, although it has made its appearance to some extent in the Auckland commercial-fruit area. It is, however, gratifying to note that it has been efficiently dealt with in most cases, though in two instances where apple-orchards were badly infected the occupiers so neglected to carry out efficient control measures that the Department found it necessary to enter and do the work at their expense. Although the Department's officers are always willing to assist, as far as opportunity permits, in the identification, &c., of the disease, it must be distinctly understood that the onus rests upon the occupier himself to see that his trees are kept free from fireblight infection.

A thorough inspection of all orchards in the infected areas is to be made at an early date, and those growers whose orchards are found to be infected will receive a short-term notice to comply with the provisions of the Orchard and Garden Diseases Act. Failure to comply will not only render them liable to prosecution and upon conviction to a fine up to £20, but will make it necessary for the Department to enter and do the work at their expense.

It is well here to remind growers in localities where fireblight has not yet been known to exist that if they notice any suspicious symptoms on their trees they should immediately notify the local Orchard Instructor.

—*J. W. Collard, Orchard Instructor, Auckland.*

POULTRY-KEEPING.

THE PULLETS.

Now that many of the pullets are half-grown it is obviously a time when they should be fed and handled with the greatest of care. The object should be to keep them steadily growing in the most natural way possible. In this respect a good range, preferably on clean ground, will do much for their proper development. Small runs, especially where the ground is stale, are not conducive to healthy growth.

The food supplied at this stage is most important. The ration should chiefly consist of sound grain materials in which good plump oats are included. This, together with an abundance of green material, grit, and clean water, is practically all they require. During the earlier chicken stage a good supply of animal food, such as meat, milk, &c., may be fed to advantage, but with the half-grown bird it should be fed with caution, or probably it will have the effect of forcing the birds to lay at too early an age. This condition should be avoided wherever possible, as it usually results in diminutive-sized specimens and layers of small eggs. It is not generally realized by poultry-keepers that once a pullet commences to lay she grows little, if at all, afterwards. Further, such birds never make desirable breeding-stock, however well they lay.

The small egg is one of the most striking weaknesses in connection with the industry to-day, and it is not the bird that develops prematurely that will correct matters in this respect. The aim of the breeder should be to attain the desired size in his stock before the productive period commences. In a general way, even with such early maturing breeds as the White Leghorn, the pullets should not commence to lay before they are at least six months old, in order that they may grow to the necessary size, possess the requisite constitutional vigour, and produce a good-sized egg.

The growing birds should not on any account be overcrowded, or trouble may be expected by way of vermin and disease. The profits to be made from poultry largely depend on the management the birds receive during all stages of their development. Any set-back received during the growing-period is never caught up.

LEG-WEAKNESS IN COCKERELS.

This is one of the many troubles affecting poultry which prevention is the only way of fighting. It is usually caused through insufficient exercise and the overfeeding of forcing-foods such as meat, milk, &c. A common mistake made by many poultry-keepers in connection with this trouble is that they select the most promising cockerels in the flock for future breeding purposes, and then place them in small runs, coops, &c. In order that they may make special growth they then provide them with plenty of rich nourishing food and special care and management. A much better plan would be to let such birds take their chance with the ordinary flock. It stands to reason that feeding rich foods to a bird during the growing stage and

curtailing its exercise will have the effect of encouraging size of body beyond that which the undeveloped legs are capable of carrying.

The growing cockerels intended for breeding should have ample range under the most natural conditions possible so that they may develop in a natural way. Where such range is not available the birds should be compelled to exercise by providing ample litter and feeding the grain foods in it. Once a cockerel becomes weak in the legs it will never make a high-class sire, as this indicates that it has an hereditary weakness or that its stamina has been weakened by improper management. Of course, where birds are to be marketed at the right age—at about four and a half months old—and in a prime condition, forcing-food as well as confined quarters are necessary so that they may make the greatest growth possible in the shortest space of time.

Very often in the case of the heavy-combed breeds, such as White Leghorns, Minorcas, &c., leg-weakness is accompanied by falling-over of the combs. This is usually another indication of a weakened constitution, due either to an hereditary taint or to the bird being over-supplied with rich food, or by having a restricted space for exercise. Young male birds are here referred to, as sometimes a falling-over comb may be brought about at a later stage, even with the strongest of birds, by a parasite attacking the comb. Its presence is usually indicated by a yellow incrustation on the blade of the comb, which gradually increases in size and penetrates to such an extent that the comb falls over. For treatment dissolve one chinisol tablet in half a breakfast-cup of water and sponge the affected parts. If this is done when the trouble is first noticed it will soon disappear. On the other hand, if it has reached an advanced stage the only safe course is to remove the comb by means of a pair of sharp scissors. In order to prevent bleeding, a good dressing of fuller's earth should be applied to the cut parts. With birds it is intended to show, the comb should be frequently examined in order to make sure that it is not being attacked by this parasite, many a good bird having been made useless for show purposes from no other cause.

CLEAN GROUND ESSENTIAL.

I would again urge the importance of turning over every run possible, and sowing it down with a suitable green material before the season becomes too late. Such a run will make an ideal place for next season's young stock after they leave the brooder. Chickens will always develop much more rapidly on such ground than on runs which have become stale. Not only this, but the green food thus grown will prove a valuable asset during the off-season of the year. Clean ground, especially for the young birds, is one of the secrets of successful poultry-keeping, and the man who makes ample provision for this will be amply rewarded in the long-run for his trouble.

One of the worst drawbacks to stale ground is that the young birds are always liable to become infested with disease and intestinal parasites, particularly round worms. Many poultry-keepers are of the opinion that none but the adult stock suffer as a result of these parasites, but this is not the case. Cases have recently come under my notice where chickens not more than six weeks old suddenly ceased to thrive,

and many deaths took place from no other cause. Needless to say they were confined in stale runs which had previously accommodated adult stock over a period of years. The latter may do fairly well when these parasites are present, but in the case of young birds the affected cases mostly prove fatal.

It will thus be seen that the importance of having two runs to each house, allowing the birds access to them alternately, and enabling them to be frequently turned over and sown down, can scarcely be overestimated. Were this system of laying out plants more generally adopted many of the troubles due to "poultry-sick" ground would be unheard of. It must be admitted that where the soil is specially suitable for fowls (a sandy loam) they may remain more or less healthy even if the runs are not given a rest, but, generally speaking, neglect in this direction will usually result in the long-run in the production of weedy and unprofitable stock.

—F. C. Brown, Chief Poultry Instructor.

THE APIARY.

EXTRACTING.

EXTRACTING should now be in full swing in all districts of the Dominion. Where operations for any reason have been delayed care must be taken to see that the bees are not crowded out, or they will commence to loaf, and the ultimate crop will be small. It is a good policy to extract twice during the season, but where the beekeeper prefers to leave the work until the end of the flow a close watch should be kept so as to provide ample room. This, however, can only be done where large numbers of spare combs are kept on hand. It is during the season when honey is coming in freely that the beekeeper realizes that his most valuable asset, next to his bees, is a good stock of extracting-combs. Every effort should be made to get at least twenty spare combs for each hive in the apiary, and with this number always on hand the bees are not likely to be hampered for room. In the absence of plenty of drawn-out combs the best plan is to keep the extractor going, and thus prevent the bees from blocking the brood-combs. This usually happens unless ample room is provided, and as a result the queens are prevented from laying to their utmost, and the colonies dwindle. At no time during the working season should the work of the queen be hindered. Care must be taken at all times to see to this important item during the flow. The honey is quite ready to extract when the combs are three parts capped, but great care must be exercised not to extract unripe honey. Numerous instances have come under my notice where the practice of taking unripe honey has meant a total loss to the beekeeper.

Removing Honey from the Hive.

The usual practice followed when the time for extracting is at hand is to remove the frames one by one. If excluders are used much time will be saved in picking over the combs. As the combs are

taken from the hive, shake the bees in front of it, brush off the remaining bees, and place the combs in a super for removal to the honey-house. The combs should be covered with a cloth which has been previously placed in water containing a small percentage of carbolic acid. When the season is at its height very little trouble will be experienced from robbers, but in case of a stoppage in the flow this precaution is necessary. At all times the beekeeper should study his working equipment, and this is highly important when removing the honey. It will be found convenient to provide a good barrow or truck for carrying at least two full supers. Much time and labour will be saved, and the tedious work of removing the honey will be facilitated.

Uncapping.

One of the most important processes in the work of extracting is that of uncapping. There are several kinds of knives for the purpose on the market, but the stiff-bladed double-edged Bingham is usually first favourite. Two of these are necessary, and they must be stood in a pan of water which is kept boiling on a small lamp. Each knife as it becomes cold is returned to the boiling water, and the hot one takes its place. Any contrivance which is used for an uncapping-can should be provided with a cross-bar, through which to pass a screw or similar article, driven point upwards, to form a pivot on which to rest and revolve the combs. The comb should be placed with one end resting on the pivot and tilted slightly forward in order to allow the cappings to fall away from the comb. Uncapping should commence at the bottom of the comb and proceed with a sawing motion from side to side until the top is reached. The comb is then swung round on the pivot, and the reverse side treated in the same manner. Only a thin sheet of wax should be removed, but it must be done thoroughly so that every cell is opened, and at the same time the top and bottom bars should be relieved of any burr-combs which may adhere to them.

A contrivance much in favour with progressive beekeepers is the steam-heated knife. This is a Bingham knife with a soldered copper plate, so arranged that steam is forced through it from a rubber tube attached to the spout of a "bronchitis" kettle. An escape tube is fitted to the opposite side, and the knife is kept at a very high temperature all the time uncapping is proceeding, thereby obviating the work and trouble of continually plunging the knives into boiling water. For uncapping heavy fully capped frames it has no equal, as an ordinary uncapping-knife becomes cold as a rule before half one side of a full comb has been uncapped. The cappings should be left to drain for two or three days, after which time they should be gathered and melted.

Strainers.

It is not uncommon to find exposed for sale honey with which proper care and attention have not been paid to straining at the time of extracting. Nothing deters the sale of extracted honey so much as a layer of wax-particles, dead bees, &c., and it is surprising how few beekeepers take the necessary trouble to see their product reaches the customer free from wax and other impurities. In no case should honey be run direct from the extractor into the containers, but should be properly strained. It is the attention paid to this necessary

detail that aids in the sale of the crop, and when honey is properly treated it readily commands a higher price. Fine-gauge wire strainers are usually adopted, but even these are not sufficient to remove the smaller wax-particles. In order to ensure perfect condition the honey should be passed through good fine cheesecloth before being run into the tank. Cheesecloth strainers are excellent, cheap, and are easily made, while at the same time they can be readily cleansed. They remove everything but the smallest particles of wax, which should be finally disposed of when the honey is skimmed. This latter process is an important one, and should always be carried out before the honey is put up in marketable form.

Testing Honey for Ripeness.

Before tinning off the honey make certain it is ripe. Fermentation is sometimes quite a serious problem to the beekeeper, and yearly large quantities of honey which were thought to be well ripened at extracting-time ferment, more especially when left over till the weather becomes warm. The bulk of the honey produced in New Zealand is exported, and a matter of first importance is its condition on arrival at the overseas market. Usually beekeepers experience little difficulty with low specific-gravity honeys if care is exercised and only well-sealed combs are extracted from. However, to ensure that the honey is up to standard it should be tested with a hydrometer before being run into the tins. When making the test the contents of the tank should be gently paddled in order that the honey may be of the same consistency throughout. This operation is of importance, as there is always a risk of variation of the specific gravity of the honey at the bottom and top of the tank. If on testing with a Twaddel's No. 4 hydrometer the instrument does not sink below 84 a well-ripened honey is indicated. This is equal to a specific gravity of 1·42, the test being made at a temperature of 60° F. As the temperature of honey in the summer rarely sinks so low, the test may be taken at 70° or 80° by adding 1 point to the hydrometer-reading for each 10 degrees of heat over 60°. Thus, if the hydrometer sinks to 82 at a temperature of 80°, it would register 83 if taken at 70°, and 84 if taken at 60°. To arrive at the specific gravity multiply the hydrometer-reading by ·005. Thus $84 \times ·005 = ·420$; add 1 for the specific gravity of water, and it will equal 1·420. This method is only reliable up to a temperature of 90°.

Testing Thick Honey.

Sometimes the honey is so dense that the hydrometer will not sink. When such is the case take equal parts by volume (not weight) of honey and water, mix thoroughly, test with a No. 2 Twaddel's hydrometer, and then multiply the result by 2. This will give the same result as if taken with a No. 4 instrument by the direct method. Thus, if the No. 2 instrument sinks into the honey and water to 42, this multiplied by $2 = 84$. Perhaps the quickest and simplest method for testing thick honey is to have a deep glass or beaker on which is a mark to contain about 4 oz. of water. Fill up to the mark with water, then pour it into another vessel; now fill up to the mark with liquid honey, add the water previously measured, and mix thoroughly; then place in it the No. 2 hydrometer, note the number to which it sinks, and multiply

by 10; place the decimal point before the result, and add 1. Thus, if it registers 43, 43 × 10 = 430; place the decimal point before the 430 = ·430; to this add 1, which is the specific gravity of water, and the result will be 1·430.

—*E. A. Earp, Senior Apiary Instructor.*

THE GARDEN.

VEGETABLE-CULTURE.

THE winter crops should now be well established. Apply a dressing of nitrate of soda to cabbage, broccoli, and celery, and so make the most of the autumn growing season.

The tomato harvest will now be at its height where the crop is grown outside. On some dry areas water and chemical manures will be required to help the plants finish well.

As the onion, garlic, and shallot crops ripen, lift them and dry them well in the open before storing.

When lifting early potatoes keep the tubers from some of the best roots for seed, place them in shallow trays, and store in a light, airy shed.

Continue to sow salads and quick-maturing vegetables. Care should be taken to pull weeds before they seed, more especially the taller kinds.

SMALL FRUITS.

Dry weather has checked the growth in some strawberry-gardens; a dressing of superphosphate, sulphate of potash, and sulphate of ammonia applied now and harrowed in will bring the plants along with the autumn rains. Four years is about the life of a strawberry plantation, and sections to follow on should be prepared in good time. It is necessary to have the land clean and in good heart before planting this crop.

Cape gooseberries that are backward may likewise be dealt with manurially as recommended for strawberries.

Those wishing to grow passion-fruit should sow the seeds now, so that the plants will be ready for putting out in early spring.

FLOWERS AND LAWNS.

The same attention with regard to weeding is required in the flower-garden as in the vegetable section; it is sound economy to prevent weeds seeding.

The season for garden-making is at hand, and any plans for such work should be speedily completed. Many plans are too ambitious and beyond the resources of the gardener. It is wise to err on the side of simplicity and to keep the scope well within the time that can be devoted to this special work. In a garden, as elsewhere, quality is better than quantity, and will undoubtedly give greater satisfaction. The amount of work in a garden does not depend on mere size, but more on the extent of the flower-borders, and even there the work can be lessened and results improved by larger grouping.

Lawn-grass seed is best sown during the month of March, so preparations should be completed without delay. Besides cleaning the land and working it to a fine tilth, time is required to let it settle, and so avoid those potholes that are so disfiguring on a lawn that is hastily laid.

In the garden nature compels one to take a very long view. Work has to be planned six or twelve months ahead, and many chances taken; compromises and makeshifts are not effective; on some points nature is not to be coerced. One of the secrets of success is the compost heap—a heap of soil mixed and prepared, and allowed to mellow one or even two years before it is used for seed-boxes and potting. Its composition varies, naturally, under different circumstances, but the main ingredients should be six parts turfy loam, two parts well-decayed manure—say, from an old hotbed—and one part of good sharp sand. Other organic manures are sometimes used, including bonedust, or the slower and more lasting chemical fertilizers such as basic slag. Turned occasionally to allow fungi and seed weeds to exhaust themselves, this rich mould of open texture gives seedlings and cuttings an excellent start, and makes pot-plant culture a pleasure and a success. If not already prepared, it should be got ready now for the spring work.

Spring flowering bulbs should now be planted without delay; they like a rich soil with an abundance of humus. The common impression that they do not like manure is incorrect, but it must be well rotted. Planted in the grass or on the edge of shrubberies in rather large masses they are effective during winter and spring, and require very little attention.

Seeds of any or all of the following important biennials and perennials should be sown now for flowering next spring and summer: Pansies, stocks, wallflowers, ranunculus, primroses, polyanthus, hollyhocks, cineraria, antirrhinum, aquilegia, anemones, nemesia, and sweet-peas. The finer seeds are best started in boxes; benzine tins or cases may be adapted, and are then most suitable for the purpose. Place the most fibrous portions of the compost in the bottom of the box, and fill up with soil to within nearly half an inch of the edge; press it down firmly; sow the seeds; then with some soil in the sieve shake on them a light covering, and with a small piece of board press the surface firm and even. The smaller seeds may be given a very light coating of sand instead, and covered with a sheet of glass to prevent evaporation until germination has taken place. Place them in an open frame where they may be shaded from the hot sun and sheltered from heavy rains. Water with great care during early stages of growth.

Carnations may be layered. The operation known as "budding" may also be done during February.

—*William C. Hyde, Horticulture Division.*

Noxious Weeds.—The Ohinemuri County Council has declared fennel, gorse, and ox-eye daisy to be noxious weeds within that county.

ANSWERS TO INQUIRIES.

IN order to ensure reply to questions, correspondents must give their name and address, not necessarily for publication, but as a guarantee of good faith. Letters should be addressed to the Editor.

TATTOOING EAR-MARKS.

"TATTOO," Waimate :—

I should be obliged if you would inform me what is the best method of and medium for tattooing ear-marks on a pedigree herd. I have been using Indian ink with a perforating ear-marker made by Maw and Son, of London. I rubbed the pricking-points with Indian ink, and then rubbed more into the wounds, but am not satisfied with the result. The stain is feeble. Would gunpowder be better?

The Live-stock Division :—

The ear-marker mentioned by you should give satisfaction, provided care is taken in its use. The ear should first be cleaned with a little petrol to remove the grease. The marking-ink should then be rubbed over the area to be marked before making the perforation, and again after the instrument has been used. The ink should be of good quality, and be well rubbed in. It is recommended that sticks of Indian ink be used (obtainable from any large stationer at about 9d. each). Old black gunpowder may, however, be employed.

NITRATE-OF-SODA SOLUTION AND ANIMALS.

G. W. MILLER, Whangarei :—

Will you kindly inform me if nitrate of soda is poisonous to animals, as I have lately lost two cats? They were sick for about a week, and seemed to be in great pain. They had been accustomed to drinking out of the watering-can which I used for my pot-plants, and when I started using the nitrate of soda they still drank out of the can, and within two or three weeks they were both dead. I do not know of anything else that could have hurt them.

The Chemist :—

Nitrate of soda is certainly poisonous when taken in excessive doses, the symptoms being gastro-intestinal irritation; trembling, convulsions, tetanic convulsions, dilation of the pupil, and paralysis of the voluntary movements. The accumulation of nitrates in mangolds gives rise to poisoning of stock fed on them, unless the mangolds are pulled and the nitrates eliminated on storage by being transformed into other compounds. A case of this was recorded by the writer in the *Journal* for September, 1911. The solution of nitrates used for watering plants should certainly be kept out of reach of all animals.

HOME-MADE BUTTER.

"NEW SUBSCRIBER," Matawai :—

In making home-made butter from separated cream is it better to use the fresh cream, or leave it to ripen? If the latter, what time should the cream be held, and at what temperature should it be stored?

The Dairy Division :—

Butter made from sweet cream will retain its quality longer than if made from ripened cream. The flavour, however, is not so full. To make butter from sweet cream, the cream should be cooled directly it leaves the separator to a temperature of 60° F., and then let stand for at least four to six hours so as to allow the fat-globules to become completely cooled before churning. If the cream is to be ripened it should be let stand at the same temperature for from twenty to forty-eight hours longer to allow a slight degree of sourness to develop.

FEEDING SKIM-MILK TO PIGS.

C. POLAND, Paeroa :—

Is it better to feed skim-milk fresh or curdled to pigs ?

The Live-stock Division :—

Skim-milk should be fed fresh—that is, a few hours after separating—allowing all gases to escape. A good plan is to separate at night and feed milk in the morning, and *vice versa*. If the milk is allowed to remain in barrels to sour and curdle there is a danger of infection by undesirable germs. It is wisdom on the feeder's part to protect his pigs and prevent them from acquiring ailments which in the end prove very costly.

SOWING WATTLE-SEED FOR HEDGE.

H. J. WEEKS, Wanganui :—

When is the best time to sow wattle-seeds (*Acacia verticilata*), and should they be sown in nursery beds or where they are required? They are intended for a fence.

The Horticulture Division :—

The best time for sowing wattle-seed is in the spring. For the purposes of a hedge it may be sown where required. Clean and cultivate a good wide strip, giving a liberal dressing of bonedust before sowing.

COWS AND SHEEP BLOWN ON CLOVER.

WAKELIN, Winchmore :—

Could you inform me of the most simple method of dealing with cows and sheep which are blown on clover? What is your opinion regarding drenching for blown cattle ?

The Live-stock Division :—

The cause of bloating is the abundant ingestion of easily fermenting food, the most dangerous being clover, lucerne, mangolds, &c. To prevent bloating, animals should be permitted to pasture on clover-fields only after they have received some dry feed or have been fed on less luxuriant pasture, so that they will not partake of too much of the juicy fermentable food. The effect of bloating is that the gases formed tend to carry the rumen (first stomach) upwards, thereby closing the natural opening of the œsophagus by kinking the gullet, thus preventing the gases being belched up. Treatment should be as follows: First, raise the fore part by standing the animal uphill, or on a strong board placed on a bundle of straw, &c., sufficiently high to bring the opening into the rumen to the highest part. Second, draw the tongue out and at the same time irritate the back of the throat by the hand or a soft piece of rubber (a gag may be used for this). Third, massage the rumen by moderate pressure with both fists on the left flank. Surgical treatment should only be attempted after the above has failed or in a case of emergency. If this becomes necessary, and if time permits, the place should be clipped and painted with tincture of iodine, and after sterilizing the instrument it should be inserted at the highest point of the swelling on the left side, directing its point towards the right elbow. Too much gas should not be permitted to escape at once, otherwise collapse may occur, due to rupture of the blood-vessels by the sudden inrush of blood. Sheep will respond to the same treatment, but if large numbers are affected relief is often obtained by driving the sheep uphill or into a river, the latter causing contraction of the rumen. We are of opinion that the drenching of blown cows is unnecessary, but the following tonic may be given in a little gruel to a full-grown cow: Nux vomica, 1 oz.; pulverized aloes, 1 oz.; pulverized gentian, 1 oz.

FEEDING LOOSE SALT TO SHEEP.

"O. M. S.," Ashburton :—

I have been giving my sheep loose salt and mixing some stomach tonics with it. I find it answers very well, but the sheep are eating it in fairly large quantities instead of licking it. Can you tell me anything I could mix with it or do to it to make it into blocks or licks ?

The Live-stock Division :—

We cannot recommend the feeding of loose salt to sheep, as it is impossible to keep it in block form, and bad results have followed its use. Rock salt placed in suitable places is much preferable.

OAT-HUSKS AS STOCK-FOOD.

"Cockatoo," Henderson :—

Please inform me whether the husks obtainable from grain-mills are suitable for horse or dry-stock feed if crushed oats are added. Is there as much nutriment in the husk as in the straw of the oat ?

The Live-stock Division :—

The husk does not contain as much nutriment as either the straw or the oat. It has the further disadvantage of being less digestible. It is sometimes fed with other foodstuffs in order to make bulk, and if fed with oats to horses it makes them chew the oats better. Further than this it is of little use.

HEIFER WITH LEAKY TEATS.

G. W. L. Palmer, Te Kuiti :—

I have a heifer that loses a quantity of milk each day through its running away from each quarter. She is milked regularly every day at about 5 in the morning and about 3 in the afternoon. I would be obliged if you could inform me of any safe treatment.

The Live-stock Division :—

This condition is almost invariably due to the small muscular fibres (known as the sphincter) in the cow's teat, which normally act as a compressor of the teat when the quarter is distended, failing to contract, and thus allowing the milk to escape. There is no safe treatment to remedy this defect. Many appliances are sold for the purpose—such as rubber rings, teat-compressors, &c.—but they are unsatisfactory and eventually injure the delicate lining of the milk-duct. Milking the heifer three or even four times daily might be tried, and in this way the teats might after a while develop the lacking function.

PURE SEED WHEAT.

Pure seed wheat is often difficult to secure in New Zealand, and the Department of Agriculture, in conjunction with the Canterbury Agricultural College authorities, is this season doing all possible to ensure that pure seed is available for next season's sowings. A certain amount of pure seed will be available from the College Farm, but the quantity will fall far short of the amount required for seed purposes in Canterbury and North Otago next season. To make up this shortage in some degree the Department has arranged for the inspection of the present wheat crops of those farmers who bought pure seed wheat from Canterbury Agricultural College Farm last year. Those farmers whose crops are, after inspection, found to be free from foreign varieties will be given a certificate to that effect.

WEATHER RECORDS: DECEMBER AND CALENDAR YEAR 1923.

Dominion Meteorological Office.

GENERAL SUMMARY FOR DECEMBER.

SUMMER weather conditions set in very early this season, and December was, on the whole, hot and dry. Westerly winds prevailed, as in November, and no ex-tropical disturbances were experienced—the opposite of last summer, when easterly winds and ex-tropical disturbances ruled. The rainfall, therefore, has been deficient in the east-coast districts.

Anticyclonic conditions, with almost general drought, ruled in the North during the first half of the month, while there were three westerly depressions of moderate intensity passing in the South, affording scattered but much appreciated rainfall. During the latter part of the month four—and these more intense—westerly low pressures passed in the South, and also accounted for scattered rainfall in the North. They were, however, more notable for the high westerly winds and boisterous conditions which ruled, particularly in and southward of Cook Strait. The north-westerly storm which occurred on the 28th was of great force, and caused damage in the Canterbury Plains.

Hot and dry weather was experienced in the east-coast districts, and warm and humid conditions generally during the month. Rainfall was again deficient on the east coast, especially of the North Island, hardly any rain falling between East Cape and Castle Point. Only 5 points (0·05 in.) were recorded at Napier, and 11 points at Maraekakaho Station, near Hastings. Only 14 points were recorded at the latter station in the previous month, and this is the record dry two-monthly period there for thirty years. The best and most general rains occurred about the 19th and 20th. Some stations on the west coast of the North Island—for example, Inglewood and Foxton—showed total rainfalls slightly over the average, and rainfalls above the average were also experienced in Westland and parts of Otago; elsewhere the falls were from 30 to 98 per cent. below the average of the same month in former years.

—*D. C. Bates, Director.*

RAINFALL FOR DECEMBER AND CALENDAR YEAR 1923 AT REPRESENTATIVE STATIONS.

Station.	December.				Calendar Year.	
	Total Fall.	Number of Wet Days.	Maximum Fall.	Average December Rainfall.	Total Rainfall, 1923.	Average Rainfall.
North Island.						
	Inches.		Inches.	Inches.	Inches.	Inches.
Kaitaia	2·25	4	1·15	3·28	71·72	50·87
Russell	0·85	5	0·54	2·05	53·31	47·11
Whangarei	1·32	6	0·34	2·49	54·02	61·10
Auckland	2·01	12	1·08	2·82	49·09	43·85
Hamilton	2·86	11	1·70	3·68	50·68	49·72
Kawhia	2·29	11	0·50	3·21	51·53	52·70
New Plymouth ..	3·04	13	0·63	4·28	62·64	59·95
Inglewood	8·08	11	1·43	7·72	95·75	104·45
Whangamomona ..	5·07	15	0·92	5·98	72·84	80·15
Tairua, Thames ..	0·87	4	0·56	4·30	58·03	65·82
Tauranga	2·12	7	1·63	3·39	62·78	51·95
Maraehako, Opotiki ..	1·32	5	0·68	2·82	57·01	50·77
Gisborne	0·13	3	0·08	2·13	47·88	46·96
Taupo	0·18	3	0·10	3·66	44·01	45·26

RAINFALL FOR DECEMBER AND YEAR 1923—*continued.*

Station.	December.				Calendar Year.	
	Total Fall.	Number of Wet Days.	Maximum Fall.	Average December Rainfall.	Total Rainfall, 1923.	Average Rainfall.
	North Island—continued.					
	Inches.		Inches.	Inches.	Inches.	Inches.
Napier	0·05	..	..	2·30	..	36·50
Maraekakaho, Hastings	0·11	4	0·06	2·17	37·83	34·77
Taihape	1·26	12	0·30	3·43	41·36	40·18
Masterton	0·89	9	0·23	2·57	41·75	38·71
Patea	2·13	13	0·53	3·35	46·19	44·05
Wanganui	1·12	5	0·60	2·63	28·75	37·26
Foxton	3·39	8	1·45	2·17	32·34	31·43
Wellington	1·82	11	0·69	3·24	41·02	48·09
	South Island.					
Westport	9·14	21	1·62	6·60	64·81	78·31
Greymouth	6·66	22	1·14	8·95	73·72	104·13
Hokitika	11·48	22	2·10	10·51	93·59	116·53
Arthur's Pass ..	20·73	16	3·00	12·02	146·29	147·11
Okuru, Westland ..	13·12	17	3·06	11·73	118·56	148·32
Collingwood	8·49	12	1·79	8·01	88·11	99·81
Nelson	1·19	3	0·65	2·70	40·32	37·60
Spring Creek, Blenheim	0·74	5	0·55	1·93	35·32	30·12
Tophouse	4·66	13	0·81	5·00	55·63	60·78
Hanmer Springs ..	1·47	5	0·45	2·89	50·52	39·11
Highfield, Waiau ..	1·62	5	0·46	2·51	46·53	33·38
Gore Bay	1·74	8	0·63	2·12	32·83	31·63
Christchurch	2·30	9	0·88	2·03	31·30	25·00
Timaru	1·02	8	0·60	2·38	22·23	23·15
Lambrook, Fairlie ..	1·75	9	0·93	2·33	21·04	25·09
Benmore, Omarama ..	2·12	9	0·94	1·77	22·69	24·15
Oamaru	1·23	7	0·83	2·06	19·72	22·03
Queenstown	3·50	8	0·88	2·55	31·54	30·39
Clyde	1·45	5	1·10	1·79	15·13	15·03
Dunedin	1·90	11	0·65	3·49	44·70	36·85
Gore	2·25	16	0·42	3·36	..	34·44
Invercargill	3·10	19	0·44	4·36	47·83	46·48

STUD PIGS FROM ENGLAND.

THE six stud pigs which arrived from England for the Department of Agriculture last month have been placed at the Central Development Farm, Weraroa, for the present. The pigs are as follows: One Large White boar, Towgood Bar None 12th; two Large White sows, Towgood Diana 3rd and Towgood Lily 7th; one Large Black boar, Gage Orpheus; two Large Black sows, Gage Forest Lass 4th and Gage Forest Echo. All these pigs were bred by Messrs. Edward Towgood and Sons (Limited), of Sawston Mill Farm, Cambridgeshire. The two first-named animals of each breed were presented to the New Zealand Government by Mr. H. G. Spicer, who is a director of Towgood and Sons. The second sow in each case was purchased by the Government. These two were served before leaving England—the Large White by a boar, Bourne Champion Boy 38th, who won first prize at last year's Royal and other leading shows in England; and the Large Black by a very fine boar named Ashby Lex. The other boars and sows of the respective breeds are being mated together here. Full pedigrees of all the animals are held by the Department.

APPLE-PACKING STANDARDS FOR THE LOCAL MARKET.

A SYSTEM of sale for the local markets was devised last year under which fruit may be graded by the grower according to certain standards, and labelled by him accordingly, labels or "stickers" of different colours denoting the various grades. At the auction mart such fruit is set aside and examined by a Fruit Inspector of the Department of Agriculture, who either confirms the grade or, if necessary, alters it in accordance with the true quality. The fruit is then offered for sale—practically under a Government guarantee—buyers being able to purchase confidently as to the quality of the goods. The system was successfully tested in the Wellington market last year, and will be introduced generally in the other local markets of the Dominion should sufficient demand for same be made by growers in the respective districts.

The following standards have been adopted by the Department to apply to the sale of "sticker fruit" (as it is termed) during the ensuing season:—

Extra Fancy Grade (Blue Sticker).—Apples of this grade shall be of not less size than 2¼ in. (225 per case), sound, smooth, and clean. They shall be mature, well formed, hand-picked, true to name, and free from disease, spray-injury, visible bitter-pit, skin-puncture, or skin broken at stem, and other defects. Apples slightly affected by unnatural russet, or slightly blemished apples, may be included in this grade, provided that no individual apple shall have more than 2½ per cent. of its surface affected thereby. The individual apples of solid red, partial red, and striped varieties shall carry not less than 75 per cent., 50 per cent., and 33⅓ per cent. respectively of good typical colour. The individual apples of yellow or green varieties shall be of good characteristic colour.

Fancy Grade (Red Sticker).—Apples of this grade shall be of not less size than 2¼ in. (225 per case), sound, smooth, and clean. They shall be mature, well formed, hand-picked, true to name, and free from disease, visible bitter-pit, skin-puncture, or skin broken at stem, and other defects. Slightly blemished apples may be included in this grade, provided that no individual apple shall have more than 5 per cent. of its surface affected thereby. Apples affected by unnatural russet may also be included in this grade, provided that no individual apple shall have more than 5 per cent. of its surface affected thereby. The individual apples of solid red, partial red, and striped varieties shall carry not less than 50 per cent., 25 per cent., and 20 per cent. respectively of good typical colour. The individual apples of yellow or green varieties shall be of good characteristic colour.

Commercial A (Yellow Sticker).—Apples of this grade shall be of not less size than 2⅜ in. (220 per case), excepting such special dessert varieties as may be approved by the Director of the Horticulture Division, in which case the minimum size shall not be less than 2¼ in. (225 per case). They shall be mature, sound, smooth, clean, well formed, hand-picked, true to name, and free from disease, visible bitter-pit, skin-puncture, or skin broken at stem, and other defects. Slightly blemished apples may be included in this grade, provided that no individual apple shall have more than 5 per cent. of its surface affected thereby. Apples affected by unnatural russet may also be included in this grade, provided that no individual apple shall have more than 15 per cent. of its surface affected thereby. The individual apples of solid red, partial red, and striped varieties shall carry not less than 30 per cent., 15 per cent., and 10 per cent. respectively of good typical colour. The individual apples of yellow or green varieties shall be of good characteristic colour.

Commercial B (Yellow Sticker with Diagonal Bar).—Apples of this grade shall be of not less size than 2⅜ in. (200 per case), excepting such special dessert varieties as may be approved by the Director of the Horticulture Division, in which case the minimum size shall not be less than 2¼ in. (225 per case), moderately clean, sound, mature, true to name, free from disease (excepting black-spot) and visible bitter-pit. Blemished apples may be included in this grade, provided that no individual apple shall have more than 7½ per cent. of its surface affected thereby. Apples affected by unnatural russet may also be included in this grade, but no individual apple shall have more than 33⅓ per cent. of its surface affected thereby. Apples affected with black-spot may be included in this grade, provided the aggregate area of such infection does not exceed ⅝ in. in diameter with respect to Delicious, or ⅜ in. with respect to all other varieties.

General.—Five per cent. reduction in the colour requirements of Fancy grade will be allowed as for export. Fifty per cent. of russet will be allowed in Fancy and Commercial A grades with respect to Sturmer apples; there will be no russet restrictions on Sturmers in Commercial B grade; provided that in neither case the apple is distorted thereby.

Stickers may be obtained from the Horticulture Division, Department of Agriculture, Wellington, or from any district Orchard Instructor.

WORLD'S WHEAT SUPPLIES AND REQUIREMENTS.

ACCORDING to an estimate made by the International Institute of Agriculture the wheat-exporting countries are, theoretically, in a position to furnish to the importing countries during the cereal season from 1st August, 1923, to 31st July, 1924, about 570 million centals of wheat. To this quantity Canada could contribute about 221 million centals, the United States a little over 112 million, India 12 million, Argentina 122 million, Australia 55 million, while the Balkans, Hungary, Russia, and the French colonies in North Africa could furnish altogether about 45 million centals.

The Institute states that estimates of probable requirements in the importing countries are not at all easy to prepare for the current season, owing to recurring difficulties presented by the financial and economic conditions existing in sundry European States and by the efforts of some Governments to limit imports of foreign wheat. In pre-war times it might generally be assumed that individual consumption in a given country would not vary much from year to year. Having ascertained the quantity produced in a certain country during a stated season, it was possible to define with fairly close approximation the quantity of wheat required to supplement home production during the twelve months. Now, however, the basis for such an estimate has become much less secure, and it by no means follows that a short crop entails a correspondingly larger import, or *vice versa*. There is proof of this in effecting comparison between data of production and imports for the two seasons 1921–22 and 1922–23 respectively.

Although the 1922 crops in importing countries were 110 million centals less than in 1921, these countries took, between 1st August, 1922, and 31st July, 1923, much the same quantity of foreign wheat. For the most part the causes leading to such a decline in consumption are still in operation. Even if the plentiful yields so general in 1923 should result, for some countries, in a larger consumption than last year's, it seems probable that import requirements between 1st August, 1923, and 31st July, 1924, will be on a more restricted scale than those of last season. In any event these imports are unlikely to exceed last year's total of 430 million centals.

To sum up: (1.) The quantity of wheat that theoretically might be despatched by the exporting countries to the importing States between 1st August, 1923, and 31st July, 1924, is about 570 million centals. (2.) The quantities required for the same period by importing countries to supplement their home production may reach 430 million centals at most, but it is improbable that this figure will be attained. (3.) The quantity available in exporting countries will therefore suffice to meet the requirements of the importing countries until the next harvest in the Northern Hemisphere and to leave a surplus on hand at 1st August, 1924. This surplus may be estimated at not less than 140 million centals.

British Market for Peas and Beans.—The following information was cabled by the High Commissioner, London, on 5th January: Peas—General demand for round blue, and small hand-picked Dutch and English have advanced about 40s. per ton. New Zealand ex store are worth £17 to £21 per ton according to quality; Tasmanian about £22. Large quantities of Japanese arriving and afloat quoted at £21 15s. c.i.f. Better inquiry for maple, but stocks of New Zealand are large; ex store quotations are New Zealand, 73s. to 75s. per 504 lb.; Tasmanian, 90s. to 95s.; Tasmanian February shipments quoted at 95s.; February–March shipments, 87s. 6d. Beans—English selling at 42s. to 45s. per quarter.

INVENTIONS OF AGRICULTURAL INTEREST.

WITH a view to giving as much publicity as possible to inventions, thus promoting industry, the New Zealand Patent Office now supplies copies of full specifications and drawings of inventions for which applications for patents have been received by it, at a charge of 1s. each.

Recent applications for patents of agricultural interest (published with abridged specifications in the *New Zealand Patent Office Journal*) include the following:—

Milk measuring and sampling appliance (J. W. Fuge and W. Barton, Featherston); tractor-plough-height adjustment (W. Bowis, Doyleston); appliance for measuring and sampling milk (K. Prime, Wellsford); milking-machine (J. Edmonds, Mata, Whangarei); bag loader and unloader (D. W. Ross, Kaiapoi); chicken-brooder (H. J. L. Williams, Spreydon, Christchurch); link-attaching rack for swingletrees (Booth, Macdonald, and Co., Christchurch); vacuum-producer for milking-machines (R. Preston, Mangapapa); cheese-press (W. L. Luxford, Auckland); milking-machine pulsator (R. F. Mehrtens, Te Aroha); shearing-comb and fixed cutter (M. W. McArdle, Chicago); releaser and measurer for milking-machines (D. M. Wallace, Te Aroha); milking-machine improvement (N. J. Daysh, Palmerston North); apparatus and process for magnetic separation of seeds (Elizabeth M. Bedell, Limpsfield, England); device for fruit, &c., stacking in storage (D. Blanche, Mapua); milking-machine milk-measuring apparatus (D. M. Wallace, Te Aroha); concrete fencing-post (R. T. Saunders and L. G. Benton, Featherston).

No recommendation of any of the above-mentioned inventions is implied by this notice. Applications for copies of specifications, &c., should be addressed to the Registrar of Patents, Wellington.

FORTHCOMING AGRICULTURAL SHOWS.

Woodville A. and P. Association: Woodville, 22nd and 23rd January.
Horowhenua A. and P. Association: Levin, 30th and 31st January.
Feilding I., A., and P. Association: Feilding, 5th and 6th February.
Buller A. and P. Association: Westport, 8th and 9th February.
Clevedon A. and P. Association: Clevedon, 9th February.
Rodney Agricultural Society: Warkworth, 9th February.
Dannevirke A. and P. Association: Dannevirke, 13th and 14th February.
Te Puke Agricultural Association: Te Puke, 14th February.
Masterton A. and P. Association: Solway, 19th and 20th February.
West Coast A., P., and I. Association: Greymouth, 19th and 20th February.
Whakatane A. and P. Association: Whakatane, 20th February.
Katikati A. and P. Society: Katikati, 21st February.
Franklin A. and P. Society: Pukekohe, 22nd and 23rd February.
Rotorua A. and P. Association: Rotorua, 27th February.
Opotiki A. and P. Association: Opotiki, 27th February.
Tauranga A. and P. Association: Tauranga, 28th February.
Waipu Agricultural Association: Waipu, 28th February.
Omaha and Pakiri A. and H. Society: Leigh, 1st March.
Taumarunui A. and P. Association: Taumarunui, 5th March.
Taranaki Metropolitan Agricultural Society: New Plymouth, 5th and 6th March.
Waikato Central Agricultural Association: Cambridge, 5th and 6th March.
Mangonui County A. and P. Association: Kaitaia, 8th March.
Morrinsville A., P., and H. Society: Morrinsville, 12th March.
King Country Central A. and P. Association: Te Kuiti, 13th March.
Hawke's Bay A. and P. Society: Hastings, 18th and 19th March.
Mayfield A. and P. Association: Mayfield, 22nd March.
Methven A. and P. Association: Methven, 27th March.
Temuka and Geraldine A. and P. Association: Winchester, 3rd April.

(Agricultural and Pastoral Association secretaries are invited to supply dates and location of their shows.)